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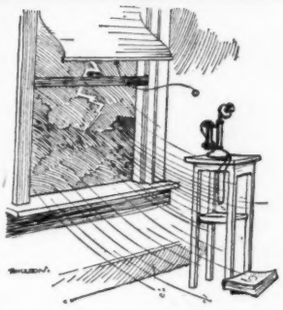

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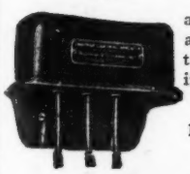

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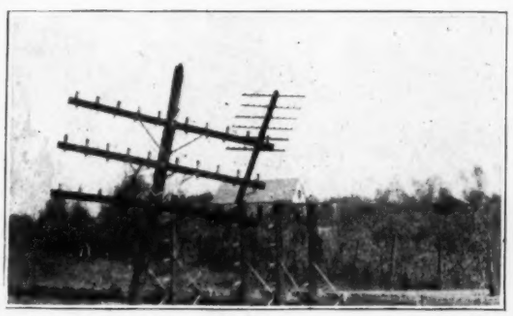

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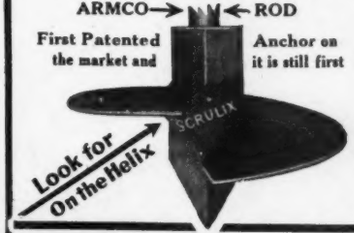

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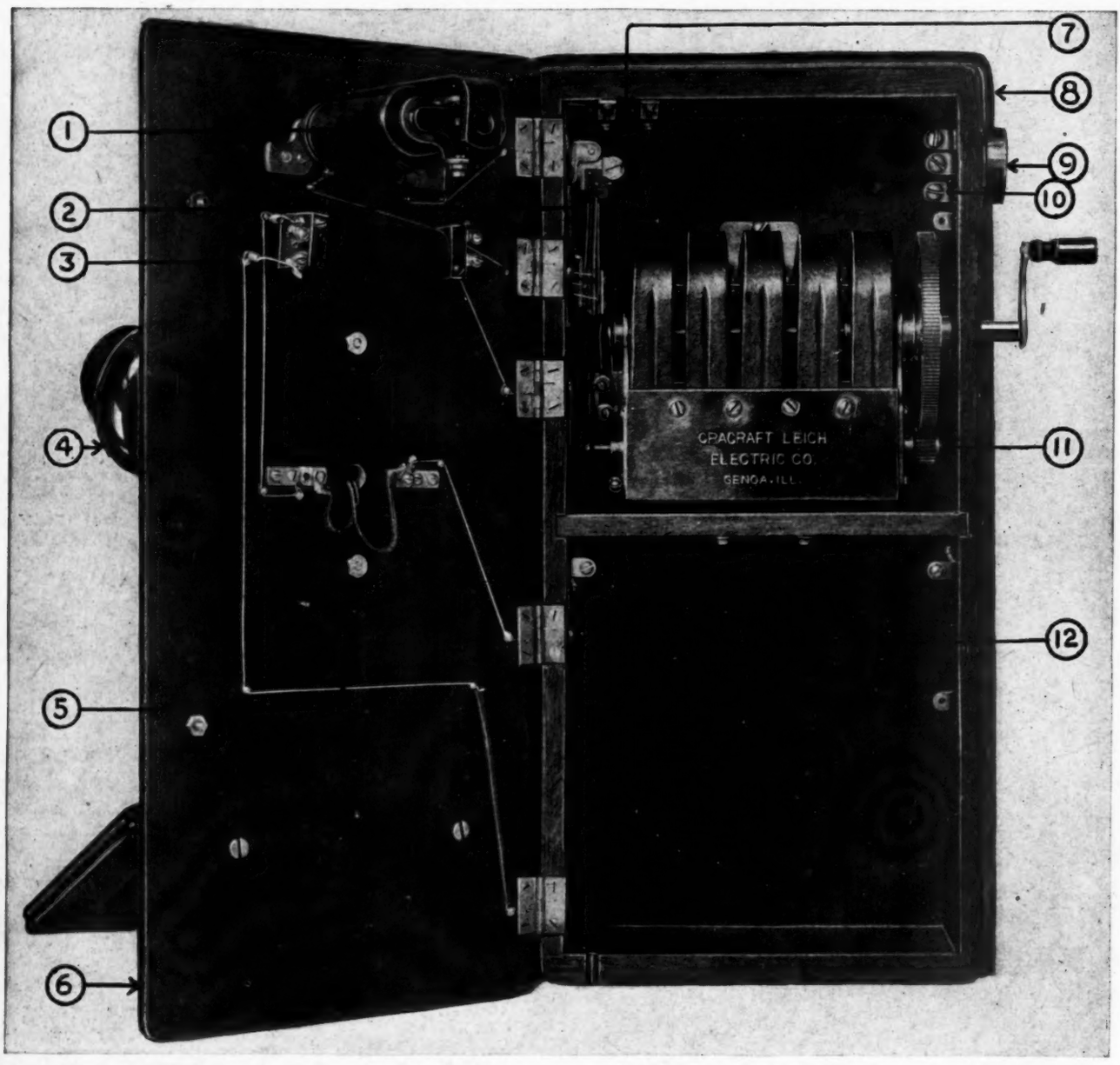

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Telephony.

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GETTING AHEAD IN BUSINESS.

The man who knows a little, studies to learn more and does the best he can on everything—will go farther than the man who thinks he knows it all, and therefore does not have to apply himself.—J. J. Hill.

The Problem of High Tension Interference.

The problem of interference of high tension power and transmission lines with rural telephone lines is one of increasing importance to telephone companies. Electricity is being used more and more every year and the tendency is toward transmitting it from large generating stations to distributing points many miles distant. This distribution involves, of course, the building of transmission lines, generally along the country highways, although sometimes they are located on private rights of way. It is with the power lines located along the public highways that the telephone companies experience the greatest difficulty, especially in cases where grounded line telephone systems are used.

In the Middle West and Western states, the grounded rural line is largely used. An idea of its extensive use may be gained from figures which have been compiled in Iowa. In this state, which has some 465,000 telephones, it is estimated that there are 225,000 farm telephones. Of this number approximately 220,000 are on grounded lines. The advent of power transmission lines, therefore, is a matter of considerable moment and especially to those telephone companies operating rural lines.

Usually the first intimation that a transmission line is to be constructed in proximity to the telephone lines in any locality is an actual preparation for the work. Somehow or other, the power company has received a franchise or right to construct its lines along the highway. Possibly the governing body which issued the permit, is the state utility or state railroad commission. In other cases it may be the county highway commissioners. But in any event it is seldom that the telephone company knows anything about an application for a permit until it has been granted and construction work begun. Then it is too late to make an effective protest.

Preparedness is a topic of nation-wide conversation at the present time. It refers not only to preparedness as a nation but preparedness as regards business. The application of preparedness in respect to high tension interference with telephone lines, would appear to be in the telephone company filing a notice with the governing body which has to do with the issuance of permits for the use of highways in its locality for electrical transmission purposes.

A notice filed with the governing body by the telephone company, requesting that advice be given of any application for the use of the highways along which telephone lines extend, for the purpose of erecting a power transmission line, would undoubtedly be an effective preparatory step. Advance notice of contemplated construction of transmission lines in a telephone company's territory would enable the telephone company to study the situation and make such representation to the governing body as would result in arrangements satisfactory to both the telephone and power companies relative to the routes of the lines.

There is, of course, no known method of entirely eliminating the inductive effects from power transmission lines located in close proximity to telephone lines, but they may be greatly mitigated. Prompt action by telephone company officials in presenting their objections to the construction of proposed transmission lines in the immediate vicinity of their telephone lines and co-operation with the transmission companies, would do much to protect their interests.

The governing body having jurisdiction in regard to applications for permits for the building of transmission lines along public highways, without doubt, would give the desired notice to telephone companies of the proposed extension of the power line. The managements of telephone companies, even though at present not experiencing interference difficulties or anticipating any, will do well to file requests with the proper authorities for the notification suggested. "Forewarned is Forearmed."

The Funnel

By HERBERT KAUFMAN

You're a funnel—with a big mouth and nothing to back it up. You can't hold your opportunities and so the man below you is always getting the chances you fail to catch.

Your one great fault is inability to retain instructions. You'd be a telling factor in affairs if you'd do as you're told. If you don't change we will. Why continue to put valuables in a safe that won't shut—money in a torn pocket?

There are so many thumb-fingered minds about, that it's galling to find a bright, sturdy one like yours unavailable for further responsibilities only because you won't mend the gaps in your ways.

You might "deliver the goods" if you'd read directions but you will turn at the wrong bend and lose the way. You land an order, almost make a customer, and nullify the transaction by omitting some special specification—a minor matter, but sufficient to irritate him into a cancellation.

You travel a hundred miles for an appointment, fix an hour to show samples, and then deliberately fritter the night away gambling or carousing—neglect to leave a call—oversleep, or turn up with a flock of wool in your mouth and a headache jumping where your wits should be leaping.

Your faults are inexcusable—preventable, paltry blunders. The least exercise of caution and care would change you into a first-class man.

You don't complete your work. You're slipshod. You commit errors that a conscientious schoolboy would avoid. You're a submarine—a menace to commerce—and unless you conform to rules and regulations you'll be blacklisted and outlawed. Nobody wants haphazard employes.

We can't rely upon you to fulfill your promises. You're a wild deuce—we are never sure what will happen when you're in the game. Technicalities "tire you." Details "slip your memory." You "lose interest" and we lose out.

Success hinges on a series of little moves. No man can become efficient without a regard for small matters. Surgical and other operations, however brilliant, are ineffective unless cleanly executed.

Your intelligence is not under indictment, but you aren't thorough. Nature blessed you with a ready brain but it isn't a steady one. We admire your excellencies but we cannot overlook your eccentricities. You're too erratic to be trusted. There's a constantly growing prejudice against the engagement of shooting stars. They don't stick to a course and can't be located in emergencies.

Competition is waged so fiercely and our enterprises are conducted on so vast a scale, that the margin between profit and loss is frequently a matter of fractions—often the mistakes of a man like you.

We aren't shy of telescope talent. Thousands can foresee the big things to do but we're woefully short on microscope intelligence—the patient, orderly, analytical quality which comprehends and appreciates the potentialities of seeming trifles—the capacity for harm in the inaccuracies which escape the notice of hasty, wasty folk.

Microbes and carelessness achieve monstrous results. The man who can see a germ or a loose screw in its actually huge dimensions is so rare that he can write his own price ticket and is always cheap at the price.

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Is Public Willing to Learn Truth About Undercharges?

Discussion of a Subject That Is of Vital Importance to Telephone Companies at the Present Time—Reasons Why Rates Will Have to Be Raised—Manner and Character of Education Given to the Public in Regard to Utilities

By James H. Shoemaker

Almost the last man of whom it might have been expected asked, recently, "Do you think the people are willing to be taught the truth? Are they as willing to receive the truth about undercharges as about overcharges?"

This telephone manager began his career at the time of the expiration of the basic patents. He controls, as well as manages, three of the thriftiest exchanges in his state. His idea seems to me to be worth thinking about, and it is that many telephone companies and other utilities will be compelled to raise rates—to overcome what he calls undercharges.

For assuming that rates will have to be raised, this manager gives the following reasons:

1. At the start almost every manager of almost every new business has felt forced to make the best possible showing. Many new ventures of the past would never have lived through the trying and expensive experiences of their infancy except for this all but universal habit of putting the best foot forward in the matter of showing book profits.

The telephone business is no exception to this general rule. And this is a matter which may be overdone. In fact, it has been overdone in certain instances. Failures of ventures in the telephone field, as well as in other lines, are not fully accounted for until a frank acknowledgment has been made to the effect that their earlier showing of profits was exaggerated.

2. Inseparable from the foregoing is the tendency to wholly overlook some of the items of expense and to underestimate others. Twenty years after the public regulation of railways had been begun, articles appeared in magazines in which accountants and financiers argued against what was then a new proposal—the proposal that every railway balance sheet should have an allowance for depreciation for the current year and a depreciation reserve.

The objections were based upon the fact that the proposal was revolutionary. It was said that taking depreciation into account would decrease the showing of profits to such an extent that a world-wide financial panic would be the result. And that there has been a decrease in the extension and improvement of railways is a fact which can not be denied; nor that there has been a decrease, also, in the volume of funds seeking investment in railways—however futile or erroneous the protest against depreciation may have been. It is well to remember that even now, after 30 years of railway regulation, the allowances of the different railways for depreciation varies from as low as 1 per cent. yearly for some of them to as high as 6 per cent. for others.

3. Besides making allowance for the actual depreciation of the future, there must be a doubling up, to overcome the neglect of the depreciation reserve of the past—unless the investors are made to suffer in the end for the undercharges of the past.

4. Wages are increasing.

5. Taxes are being advanced.

6. Civilization's progress naturally demands a constantly improved quality of service from every utility; and, in addition to this, from the telephone company it demands a constantly increasing quantity; also a constantly increasing number of connections per telephone, especially in the flat-rate and medium-sized exchanges.

7. "That the people may know," or educating the public about those things which in the immediate future must be better known, means an item of expense which is not insignificant. This is a matter which has not as yet received the attention which it demands—in any line of business, least of all in the telephone field. For a few years at least this expense is sure to grow.

The wages, hotel bills and incidentals of the 640 railway employes in New York City and Washington for a month at a time must cost the railway brotherhoods an enormous sum. And every telephone manager knows that when seeking shorter hours or higher pay employes do not publish everything that it is necessary for the public to know. Think, therefore, of what it must cost the railroads to meet this expense—for merely letting the people know—to say nothing of the ultimate cost of a strike, insubordination and all the rest of the expenses accompanying an appeal of this sort to public opinion.

Few, if any, of the utilities have ever had a place for expenses of this kind. They have been treated as exceptional or temporary. But it becomes plainer every day that, for the next few years at least, they must be met as a regular and permanent expense. And, as in the case of the first recognition of depreciation, when this expense is fully faced it means a sort of double debit against the past showing of profits.

8. It is not possible for utilities, least of all for locally-owned and locally-managed telephone companies to immediately and all at once "turn down" the W. C. T. U., the Ladies' Aid, the Y. W. C. A., the Y. M. C. A., the Women's Relief Corps, the High School Annual, the Labor Union's Ball, the Associated Charities, the Commercial Club and all the others to whom they have been contributing.

If the Interstate Commerce Commission's prohibition of payments of this nature is heeded, as it must be, then it will be necessary to "taper off," perhaps, by requiring something for this fund from the dividends heretofore paid to investors. The commission says such payments must be accounted for as "dividends paid to subscribers." But that does not change the sentiment which makes immediate evasion of payment impossible, nor does it "buy bread" for the investor. The net result is the same to the investor, whichever way it is accounted for. But, until the public can be educated to accept the change willingly, the out-go continues, besides the cost of "letting the people know" about a matter concerning which they would much rather be uninformed.

When I called at this manager's office he was reading TELEPHONY. I soon learned that he was reading the excellent article by O. F. Berry, which appeared in the issue of August 12. He was just finishing the part about the necessity of educating the public, and immediately after asking the beforementioned questions, he read from that portion of the article these two sentences:

"The telephone business which we have created and brought up to its present state of efficiency will, in the future, either succeed or fail in proportion to the manner and character of the education given to the public.

If we expect to succeed in this great enterprise, we must educate, satisfy, and please the people."

Recently I read that not more than one man in a thousand is really able to think for himself, and that only about twenty-five could make even a good pretense of thinking while of this small group, twenty-four "merely think they are thinking." Since reading that article, I've taken my place with the "overwhelming majority," and, perhaps, this exceptionally successful manager belongs in "my crowd," also. Now this manager is a great reader. In the past I've always contended that he is the deepest thinker actively engaged in the operating field today. Now, I believe we are compelled to admit that he thinks more effectually than the average regardless of comparisons, odious or otherwise.

"Mr. Berry is unquestionably right when he says that we must '*educate, satisfy* and *please* the people,'" said he. "No one can reasonably disagree with him—yet I sometimes feel

as if the call to do that is about the same as being commanded to go north and south at the same time."

This is the first time I'd ever heard one word from him which sounded in the least like doubt or dissatisfaction, and it took some time before I was able to convince myself as to the cause of his temporary "blues." The man has always been one of the most hopeful and the most enthusiastic of all the men from whom I'm privileged to get orders.

My main object is to tell what he said about this matter of educating the people, for in spite of his temporary grouch, it is the best I've ever heard on that subject. You'll understand the matter better if I first let you into the secret as to why he had gotten into this unusual state of mind.

Situation Confronting One Manager.

A scheming politician wants to be mayor in one of the towns in which he is operating a telephone exchange. The schemer's plan is to get himself elected as the best defender of the public against the people's foe, the telephone company. The telephone company has not done a thing to dissatisfy or to displease the people. On the contrary, the people are completely satisfied and pleased—so far as they, themselves, know anything about the matter, at this time. But if this man's scheme for becoming mayor can be "put through," those people will be both dissatisfied and displeased before the time for the nominating of candidates for the mayoralty arrives.

Just now, this otherwise optimistic manager is unable to see as clearly as he might wish to, just how to "meet the situation." The schemer first hoped to win public favor by crying out against the company's failure to reduce its charges as its number of subscribers increased. The manager believes he made an almost fatal mistake by going privately to the schemer and actually convincing him of the truth—that the cost increases as the number of telephones is increased.

He thinks, now, it would have been far better to have "allowed the schemer to have rope enough to hang himself," so far as that matter is concerned. The politician, being thus convinced, has abandoned his first cry and is finding other and more subtle schemes for stirring up dissatisfaction and displeasure among the people.

Happening to have a copy of Vol. I of "Applied History," by E. H. Downey, of the University of Wisconsin, with me, I read from the section devoted to "Urban Utilities." It was the part which says that if politicians were to be denied the use of utilities as convenient crutches with which to get into office, "ar oft-repeated and ever reliable campaign issue would lose most of its value.

"As soon as an effective state commission has been established, no Carter Harrison, Tom Johnson, or Mayor Pingree is needed to deliver cities from bondage to the public service corporations. Opportunities for 'easy money' would likewise be curtailed —a consideration which would have weight with dishonest officials, if any such there be."

I suggested to my perplexed friend, the manager, that the curtailment of opportunity for "easy money" is a consideration also having weight with dishonest would-be officials, if any such there be.

This schemer has no hesitation about saying that the state commission is a hindrance. There are many things which he would like to do to the telephone company and which he feels sure he could accomplish if the commission were only out of the way. Under the guise of municipal police authority, he proposes and agitates things which he tells the people must be done. They are things which he has devised solely for the strengthening of his own popularity as a "corporation fighter" and which will be alarmingly expensive and seriously embarrassing for the telephone company.

We all know, of course, that eventually every obstacle thus placed in the telephone company's way will injure the public fully as much as the company. But it is within the possibilities—my friend thinks it probable, even—that in the meantime this designing man will have won his election to the mayoralty. It is this feature of the case that is causing his temporary "blueness."

To fully explain the manager's idea, concerning the raising of an unsuspected undercharge, I must repeat a bit of his personal experience which he gave to me as an illustration.

His young wife ran an account at a store and undertook to list every purchase upon a record of her own—"as a safeguard against overcharges." At the end of the first month, the amount of the bill rendered by the store exceeded the total of her list. An itemized list was obtained from the store.

At the first glance, she saw three articles which she happened to know had been bought at that store by a friend and which had been charged to her husband, the manager, in error. He took the bill back, had the correction made, and paid the reduced amount. But his interest had been aroused, by reason of the fact that this reduction made the store's total *less* than his wife's total.

Mere curiosity caused him to check item against item, when he got home. To his surprise he found that there were still items on the store's bill which were not on his wife's list, and items on the list which were not yet on the bill. Upon careful investigation both he and his wife became thoroughly convinced that she had missed the listing of some of the things which she had actually bought, and that to be correct every item on her list not already on the store's bill, should be added thereto. But that would require the payment of between three and four dollars more—after the manager had obtained a receipt "in full to date."

"We thought our list would be a safeguard against *overcharges,* but it proved to be unquestionable evidence of an *undercharge,*" said the manager. "Could one feel 'satisfied' or 'pleased' with education gained in this way?"

"I've always pretended to be doing as I would be done by," he continued. "But it took me a moment or two to get over the dissatisfaction and the displeasure of that bit of education about undercharges. In fact, I had to make some slight effort with my own feelings before it was easy for me to get three dollars' worth of satisfaction and pleasure out of jollying that storekeeper while putting myself square with him, the next morning.

Attitudes of Commissions and Public are Different.

"You know me well enough to do your own guessing as to whether or not we kept up the practice of making that kind of a list, after we became assured that it was *not* a safeguard against overcharges. But my point is this," he continued. "Our state commissioners know as well as can be that if depreciation were fully accounted for, up to the maximum, I'd not be able to make any showing of profits whatever for a year or two at least. It would eat up the profits for a few years replenishing the depreciation reserve.

"I think, also, that the commissioners really wish there might be some way by which to raise my rates to the point where they would produce a safer ratio of reserve. Of course, I feel the need of enough higher rates to place my reserve upon a more secure basis, but I am not sure that in the long run it would be best for my company to have the commission's approval at this time for a rate raise, much as I need the raise.

The Biblical philosopher who said that some things which are theoretically right may be temporarily inexpedient, had in mind something akin to my situation—if I size it up correctly. I know a man who got the commissioner's approval for a raise of rates, but his people were so dissatisfied and displeased thereby that he was forced to sell out, as the only thing which would 'save the day.'

I want you to realize that I have no ground whatever for blaming the commissioners. That would be the greatest of all follies. But what can I, myself, do to educate my people? What will satisfy and please them even if I do succeed in convincing them that they have heretofore been undercharged?

What good will it do to force them to grudgingly admit that they have been under-charged, if I am unable to make them feel satisfied and pleased about 'paying up'?"

This man has a problem in his home town which is different but no less perplexing, so far as the educating of the people is concerned. There it is the publisher of the leading newspaper who causes anxiety. The manager's company has always used more than enough advertising space to pay the equivalent of the newspaper's telephone bills, but it is one of the papers which always "earns a deficit."

The politicians who started it, have accomplished their purpose. Therefore they are not willing to make up its deficit for the future as they did in the past. It is a case of "find some other silent supporter or 'get out,'" as the publisher expresses it.

The manager's trouble and prospective expense, due to the agitation of the would-be mayor in the nearby town, is fully known to this publisher. The publisher insists that instead of incurring a loss from a similar cause in the home town the manager shall pay "silently" to make up the deficit which the newspaper business is "earning." The publisher insists that this must be done so that the telephone company may have an effectual means for "educating the people," and of avoiding, in the home town, the kind of expense which is seemingly unavoidable in the schemer's town.

"I told this publisher," said the manager, "that if he could get even the tacit consent of the commissioners, I'd be glad to do as he wishes, but I could not think of bearing a burden like that and attempting to deceive both the public and the commissioners as to the purpose for which the money was paid by my company. I showed him how I was not allowed to make any donations, not even to such an institution as the Y. M. C. A., and that every such expenditure had to be shown as a dividend or return paid to the shareholders, not as an expenditure for operation."

"Then increase the dividends to your shareholders enough to enable them to make up the monthly deficit of my paper," was his argument in response to that suggestion. Finally I had to point him to where he himself had been saying almost daily for years that both newspapers and telephone companies are servants of the people, bound to 'play fair' at all times with their master, the public. But to this he merely replied:

> Why, of course, we say that in the paper! We say it because *it must be said*. But saying it does not make it true, for no paper can serve the public one minute longer than the public supports it. No undertaking can serve the public unless the public gives it support enough to pay wages and get bread for those who do the job.
>
> My paper was never supported by the public. It was never intended for that purpose. Never for a single month has the public paid our business enough to be entitled to its support. The public is unwilling to pay enough to support very many of the greatest dailies. Their advertisers support them.
>
> If the public is, as you say, unwilling to pay in full for the support of your business, I see no reason why the public's interests should be considered so sacred by you. To be sure, we've always pretended that we were serving the public. We had to do that for the public like such nonsense—otherwise it would not accept three or four cents' worth of bare white paper in a one-cent daily.
>
> The people are better satisfied and better pleased when they are lied to than when they are told the truth. And we've been "enterprising rather than accurate," as it is put in one of the religious exchanges which comes to my office.

The manager then showed me the clipping from the religious weekly. It says:

> The Persian mystic, Abbas Effendi, told the Chicago newspaper reporters that newspapers should be purveyors of truth, and he had noticed that American newspapers are untruthful. The reporters thought that a joke, and told it on themselves.
>
> But the old Persian mystic is right. It is not unreasonable to expect that newspapers will tell the truth. They do tell it sometimes, and it is surprising how well they get it, but they care more for *enterprise* than for *accuracy*.

While his outlook is a bit clouded by these two perplexities for tomorrow and the next day, I am sure that a year from now this enterprising manager will "pull through all right." And I hope to tell you how he did it, after the victory is won. I'm hoping that possibly he'll start something which will persuade the commissioners, the political scientists, or somebody to get at the root of the evils which are troubling him, and that a generous fund for the educating of the people, concerning the people's own best interests in cases of this kind, will eventually be allowed among the legitimate expenses of utility companies.

There's a bee of that kind in his bonnet now, but I was unable to get him to let it out at this time. I know he's struggling with the problem of how to get the people to be really as satisfied and pleased to "pay up" when there is unanswerable proof that an *undercharge* exists as to accept credit on a reduction when shown that an *overcharge* has been made.

This, however, is what I have desired to make plain:

First, I wanted to make plain some of the existing perplexities actually confronting the best educator of the people of whom I have any knowledge.

While this is fictional, as it obviously must be, to the extent that the location and the persons interested shall by no manner of means be identifiable, there actually is in the mind of the writer, a manager whom he believes to be the best educator of the people of any telephone man of his acquaintance —and the man in question is confronted with exactly the cases here pictured. In short, every word is as close to existing conditions as it is safe to make it.

Second, the real purpose of the manager, mentioned herein, is not to seek sympathy by the line of conversation which he had with me, for he knows, like Josh Billings, that under circumstances like these, "a hungry man would rather have a five-dollar bill than the sympathy of the whole world." His main purpose is to use his own present perplexities to emphasize two of "The Important Needs," a list of which he keeps before him on a pad on his desk.

The two needs are: (a). "The unescapable need of a *united effort* for the educating of the public." (b). "An effectual remedy for the present absence of knowledge as to what shall be taught."

I trust the need of a united campaign for letting the people know the facts has been convincingly shown.

Report of Citizens Telephone Co., of Grand Rapids.

The gross earnings of the Citizens Telephone Co. of Grand Rapids, Mich., for the fiscal year ending June 30, increased $55,984.27, according to the annual report which is being distributed among the stockholders for perusal before the annual meeting to be held September 12. The net earnings increased $30,733.91, despite increase in taxes and advances ranging from 20 to 150 per cent. in the prices of material.

During the year the company made the greatest gain since 1907 in the number of telephones both in Grand Rapids and outside exchanges. There are in service now in Grand Rapids, 15,180 Citizens telephones, a net gain of 1,171. Lansing, with an increase of 783, showed the second largest net increase.

The investment in the Grand Rapids exchange was increased $45,349.77 by the installation of new equipment and apparatus, but a great deal of reconstruction work which the company had planned was deferred because of the high price of materials.

The company has outstanding $527,500 in bonds, $22,000 having been obtained from the sale of bonds during the year to care for extensions, betterments and reconstruction work. A fire insurance reserve was also established covering property on which no insurance is now being carried.

Of the 3,069 stockholders in the company, 1,467 reside in Grand Rapids.

"Telephony's" Home Study Course for Telephone Men

A Complete Presentation of the Principles Underlying Modern Telephony in All Its Branches—Arranged Systematically So That Regular Reading and Faithful Study Will Qualify Ambitious Men for Higher Positions—Prepared Under Supervision of Stanley R. Edwards—This Section Written by Jay G. Mitchell

Quiz Questions on the Preceding Installment.

467. In what way does the capacity of the standard cable used in making transmission measurements differ from ordinary good switchboard cable? How does the resistance?

468. What is the commercial limit for transmission losses?

469. Name some of the easily remedied conditions which are sometimes responsible for transmission losses.

470. Why is it advisable to exercise care in the purchase of telephone cable?

471. Outline the principle underlying the Pupin loading coil.

472. What is the so-called Krarup system of loading?

CHAPTER XXI. Telephone Circuit Efficiency (Cont'd).

473. *Reasons for attempts to produce a telephone relay.*—Since every telephone circuit causes *some* transmission loss, it is obvious that circuits may be found in which the loss in transmission, regardless of the use of loading methods, is so great that their commercial use is entirely impracticable. This is only another way of saying that, with all the devices available to reduce the loss in the line, transmission is still definitely limited.

In all such circuits the alternating voice-carrying currents are so modified in character, in strength, or in both, that their action on the diaphragm of the receiving telephone is too slight to enable successful conversation to be carried on. Inventors familiar with the conditions encountered in transmitting telephonic currents have, accordingly, made many efforts to improve transmission by adding energy afresh to the terminals of such circuits in order to secure more extended limits for commercial transmission.

474. *Principle of the telegraph repeater.*—The addition of new energy to the intermediate terminals of long telegraph circuits is a very common and successful occurrence and the radius of transmission over such circuits is, in this way, considerably widened.

In the telegraph repeater the weak line current impulses are taken from the line and utilized in the winding of a sensitive relay whose armature opens and closes a set of battery contacts. By means of these contacts, the fresh battery current is sent out to the next section of the line in current impulses exactly similar, in length, to the orginal weak current impulses. Their voltage, however, is much greater than the voltage of the current impulses reaching the relay from the originating section of the line. The messages are, therefore, given a new lease of life by the repeater and it is possible to operate the final sounder much farther from the originating point than would be possible otherwise. Some complication, naturally, is required in the telegraph repeater to make it operative in both directions. The principle, however, is essentially as outlined with the modifications necessary for operation in both directions.

475. *One design of telephonic relay.*—Having the example of the telegraph repeater before them, it is quite natural that inventors in the telephone field should attempt to make use of the same or similar methods in the telephone relay or repeater. Until very recently the entire inventive development of telephone relays or repeaters has proceeded along rather narrow lines. The alternating voice-carrying currents have been employed by all inventors to vary the condition of the magnetic field. In this field has always been placed an armature, mechanically or otherwise linked with one of the vibrating terminals of a microphonic cell. Current from a battery sent through the cell is varied in strength by resistance changes caused by the vibrations of the armature to which the terminal of the cell is connected. The vibrations of the armature are the result of a varying magnetic field produced by the incoming alternating voice-carrying currents.

476. *Criticism made of this design of relay.*—The most obvious defect in such a design is due to the moment of inertia or dead weight of the moving parts. It is self-evident that the telephonic frequencies are too high to permit of moving *any* mass to and fro in exact phase with all of them. In fact, as light as the diaphragm of the receiver and transmitter are, and even though they vibrate over such a small amplitude, still it is reasonably certain that some of the higher *overtones* of the human voice are partially or entirely lost in telephonic transmission. Much more, then, will the linked parts of the microphone type of telephone relay fail to follow the higher frequency current waves. This is especially true when the current waves are taken from a long and inefficient circuit.

We should expect, therefore, that devices of this general character would fail under the best possible conditions, to improve the transmission of some tones altogether; would transmit others indifferently well, and would actually improve the transmission of a few. This seems to be exactly the result attained in practice with the one successful device of this type. The transmission of some tones is undoubtedly reinforced by passing through the relay, that of some is destroyed and that of others is apparently without gain and at the same time without appreciable loss.

It is plain that no device may be produced that will be free from this criticism so long as rapid mechanical movements of considerable linked masses are required in synchronism with the alternating voice-carrying currents.

477. *Operation of telephone relay.*—In Fig. 165 is shown

the principle of the only successful relay of this type in which the moment of inertia is a factor in its operation.

The battery, *F*, supplies current in the winding of the coil, *A*, which creates a magnetic flux in the core surrounded by the coil, *B*. As the alternating voice-carrying currents reach the relay over the line wires, *G* and *H*, they pass through the coil, *B*, and vary the magnetic strength of field enclosing the armature, *I*. The armature, *I*, is, therefore, alternately attracted and repelled and through a mechanical link operates the microphonic cell, *C*.

Current from the battery, *J*, flows through the primary winding of the two transformers, *D* and *E*, and induced currents are sent out on the line by the secondaries of *D* and *E*. The connections of the transformers, *C* and *D*, are carefully arranged so that the direction of the induced current sent out on the line from their secondaries is the same as that of the main line current.

This type of repeater has been successfully operated, but it is open to the suspicion of a failure to augment faithfully *all* frequencies of the voice-carrying currents.

It is reasonably certain that the insertion of the one successful repeater of this type in long circuits did produce an improvement in transmission. The peculiar thing to be noted is that it operated with any satisfaction at all in view of the undoubtedly relatively important weight of the moving parts.

478. *The vacuum tube repeater.*—Within a very recent time some actual progress has been made in the construction of a telephone relay in which the moment of inertia is not a factor of its operation. A highly exhausted tube, Fig. 166, is equipped inside with a filament, 2, a grid of wire, 1, and a metallic plate, 3, all of which have suitable terminals brought out. Current is sent through the filament, 2, from a battery, *O*, heating it in the same way as the filament of an ordinary incandescent lamp is heated by the current passing through it.

A second battery, *N*, of higher voltage is connected between one terminal of the filament and the plate, 3, in the vacuum tube. This second battery, *N*, maintains a continuous flow of current across the space in the vacuum tube between the plate, 3, and the filament, 2. A third battery, *M*, of low voltage is connected between the filament and the grid, 1.

By a suitable arrangement of repeating coils and artificial lines, a portion of the incoming alternating voice currents are sent through a coil, 4, so that the difference of potential between the grid, 1, and the hot filament, 2, is varied, rising

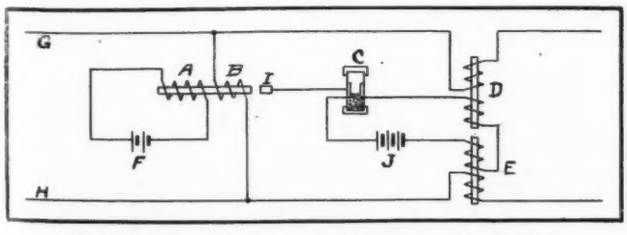


Fig. 165. Principle of Transmitter Type of Repeater.

at times above the voltage of the battery, *M*, and at times falling below it. But a change in the difference of potential between the grid, 1, and the hot filament, 2 is found, owing to the inter-relationship, to produce a corresponding variation in the current flowing between the hot filament, 2, and the plate, 3.

This variation in the current between the hot filament and the plate, 3, is employed as a reinforced alternating voice-carrying current and, by means of a suitable arrangement of repeating coils, condensers, and artificial lines, is sent out on the next section of the circuit. The terminal, *A*, of the circuit

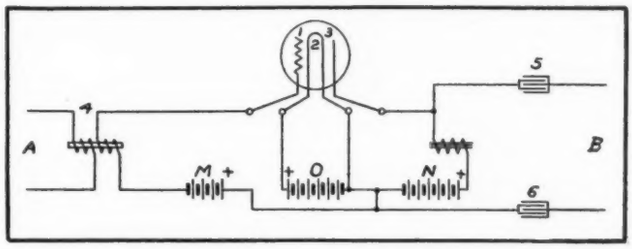


Fig. 166. Principle of Vacuum Tube Repeater.

shown in Fig. 166 is known as the input end of the repeater and the terminal, *B*, as the output end. In order that the repeater may be operative in two directions, it is necessary to employ duplicates properly connected. The gain in transmission by the use of this device is said to average about ten miles of standard cable and in favorable cases much more.

479. *Elements of the telephone relay.*—It is very apparent that the telephone relay, to be universally successful, must have no moving parts of sufficient mass to show any appreciable value for the moment of inertia. It must operate in both directions, and must actually add energy at all telephonic frequencies to the circuit in which it is placed. The vacuum tube repeater seems to conform to these requirements very closely and it is reasonable to predict its continued complete success. In fact, instruments of this type are now in successful daily operation and are giving the best of results.

(To be Continued.)

Boston Telephone Operators' Pay Increased.

By a new agreement between the Boston Telephone Operators Union and the New England Telephone & Telegraph Co., an increase in pay, shorter hours and more time off is gained. A maximum of $14 per week at the end of seven years' service is now in effect, representing an increase of $2 for the older operators.

With the exception of operators just out of training school, all will receive an increase, and in some instances the new wages are higher than those requested by the union. The new scale gives an increase of $1 per week to senior operators, and supervisors will begin at $15.50 and receive an increase of 50 cents each six months until a maximum of $17 is reached. The following table shows the previous, union, and new schedules:

	Previous Schedule	Union's Schedule	New Schedule
Training period, per week	$ 5.00	$ 5.00	$ 5.00
Assignment to work	6.00	6.00	6.00
After 3 months	6.50	6.50	7.00
After 6 months	7.00	7.00	7.00
After 8 months	7.00	7.00	8.00
After 9 months	8.00	8.00	8.00
After 1 year	8.50	8.50	9.00
After 1.5 years	9.00	9.50	9.50
After 2 years	9.50	10.00	10.00
After 2.5 years	10.00	10.50	10.50
After 3 years	10.50	11.00	11.00
After 3.5 years	11.00	11.00	11.50
After 4 years	11.00	12.00	12.00
After 5 years	12.00	13.00	12.50
After 6 years	12.00	14.00	13.00
After 7 years	12.00	14.00	14.00
After 8 years	12.00	15.00	14.00

Technical Matters of Interest to Small Exchange Managers

Some of the Fundamentals of the Technical End of the Telephone Business from the Viewpoint of the Small Exchange Owner—Paper Presented at the Annual Convention of the Oklahoma Telephone Association

By H. N. Faris

According to Webster's definition of the term, the "technical" end of the telephone business would embrace all those features in which it essentially differs from other arts, or, in short, what one entering the business for the first time ought to learn from the very beginning. There is, perhaps, no other business open to individual ownership which offers a technical side so extensive, so fascinating and so necessary to learn if the fullest degree of prosperity and satisfaction is to be gotten from it.

Telephone history shows that some of the greatest successes have been made by those who learned the technical end of the business after becoming financially interested in it. Such a working knowledge is not hard to acquire when one possessed of good common sense sets himself to finding out the "whyfore" of things constantly coming to his notice.

Qualifications for a Successful Exchange Owner.

It must not be presumed, however, that a knowledge of the technical end of the business is the only qualification necessary to a successful exchange owner. The writer does not recall a single instance where a wire chief or telephone worker who has *saved* money for the initial payment on a plant of his own has not made good, but we know of very few instances where even the most competent technical men have been successful with money inherited or borrowed for the purpose of engaging in the business on a large scale.

In many cases the man whose previous experience has been wholly technical, exhausts his time and financial resources and really neglects his business, while fussing with the equipment and trying to get his service up to a higher standard than his patrons will appreciate or be willing to pay for. And the greatest chance for a happy and successful telephone career in a small individually-owned plant seems to be with those having some previous business experience who will assiduously apply themselves to learning the technical or equipment end of the telephone industry.

The time has come when men who really know the technique of the telephone business are very difficult for the small exchange owner to hire. Such men deserve and command good salaries and will seldom go to a small town for the purpose of teaching a new owner the business. It is therefore necessary for the new owner to learn the game as quickly as possible, and we would suggest that the technical end of the business be further divided into the mechanical and the electrical and that the mechanical branch be mastered first. Thus it is more important, at the very beginning, to know how to make a good new joint than to be able to test the electrical qualities of an old one.

From the day a new owner takes charge there will be telephones to take out, move and install, and there is nothing more important than to be able to do this in a proper and permament manner. In the small town nothing is quite so satisfactory to the patrons as to see the new telephone man doing his own work.

Until he learns to locate instrument trouble promptly, the new owner will do well not to tinker telephones on the subscribers' premises. He should accordingly install new telephones for a few of the principal business houses and have a small "working capital" in used telephones, shined up like new, which can be installed for subscribers having intermittent trouble not easily located, so that their telephones can be tinkered in the privacy of the shop.

While many books have been written on the magneto telephone practice of this country, they will in general be found too voluminous and exhaustive for the beginner. Some extremely simple treatise on the principles of electricity and magnetism will better prepare him for the excellent explanatory matter to be found in the trade literature of the better manufacturers and in the instructive serial articles frequently run in the leading telephone papers.

The Signaling Equipment.

Taking up the magneto telephone, the first step is to learn the functions of the various parts, so that a pair of new batteries will not be prescribed when the bells are reported as ringing weakly. Thus a little investigation and the exercise of common sense will reveal even to the novice that the function of the ringer is only to receive calls and that of the generator is only to make calls.

Should a rural line patron complain that he cannot ring other parties successfully, although they can ring him, we must not jump at the conclusion that the generator is bad, as the trouble is far more likely to be a dried-out ground rod.

Many think the fact that the telephone receives a ring successfully proves the ground connection. But it must be remembered that the telephone will receive a ring if the ground is sufficient to pass enough current to ring only one bell, while in order to ring all other stations successfully the ground must pass sufficient current to ring all the bells or perhaps 15 times as much as is needed to receive a ring.

It often happens that generators are dissected when the trouble is really in the ground or station connections. And unless one is familiar with the elementary principles of electricity and magnetism, the generator is likely to be reassembled with some of the bars reversed after which it is still in trouble, even though a new and sufficient ground connection be provided. In general, the beginner will do well to look for trouble in the equipment as a last resort, for until a certain degree of familiarity is acquired he is likely to cause as much trouble as he cures.

Clearing a Case of Ringer Trouble.

The writer recently had a call to send a man 300 miles to help out a new owner whose ringing power seemed to "come and go," so that most of the time they were having to ring from the "side 'phone." After having the new owner chase the trouble the rest of the day, a man was sent out that night who found one of the ring-back key handles bent over until it stuck in the ringing position on a short-circuited cord. Investigation disclosed that in attempting to hang a new calendar above the switchboard the key had been stepped on and bent over sideways until it stuck in ringing position.

On receiving a report that this plug rung people all the time, the new owner had removed the plug from the cord and short-circuited it in attempting to put it back, so that the next time the bent key was operated the entire generator circuit of the one-position board was killed. This is another example of the wisdom of a beginner's looking for trouble at the point where the equipment was last "fussed" with.

But returning to the telephone discussion, the beginner should learn by simple water pipe analogies the reasons why 80-ohm ringers cannot be used on country lines and why they should

be changed before attempting to put a second telephone, or even an extension talking set on the same line.

The Talking Circuit.

After acquiring such rudimentary knowledge of the signaling equipment, the talking circuit can be taken up. The beginner should learn that the real and final talk producer is the secondary winding of the induction coil which is permanently in series with the receiver in all makes of magneto telephones. He should also learn that the primary circuit containing the battery, coarse winding of the induction coil and the transmitter or "throttle" is in a separate and distinct circuit.

With the relative locations of these pieces of apparatus once fixed in mind and their respective functions clearly understood, it is not difficult to locate trouble causes from trouble symptoms.

New owners frequently write for a list of the more commonly encountered telephone troubles and the remedy for each, just as medical tradition informs us that there or four eenturies ago the so-called "doctors" of that time attempted to treat human ailments from a list of diseases and cures, which doubtless killed as many as it helped.

The physician or "human trouble-shooter" of the present time is uniformly successful because through his accurate knowledge of the body he gets at the underlying causes from the symptoms which are shown. The successful telephone doctor must in like manner diagnose each case by applying to the symptoms manifested his knowledge of the telephone's anatomy, and the functions of its several parts.

Thus a complete understanding of what each part is for, is a first requisite to success. With such knowledge one knows immediately that when a telephone can neither hear nor be heard, the trouble must be in the receiver or secondary of the coil; and since it is hardly conceivable that both could become short-circuited at the same time, we know it is an "open" that should be looked for.

In like manner, when a telephone can hear but cannot be heard we know the trouble may be looked for in the primary circuit, inasmuch as it is almost impossible for the secondary of an induction coil to become entirely short-circuited.

Just as suggested in the case of complete telephones, substitution of parts is always better than trying to make repairs on the premises and leaves a better impression with the subscriber. In like manner, it will be found better in cases of real or imagined switchboard trouble for the new beginner to transfer lines to idle drops until a careful and leisurely search can be made for trouble on the equipment suspected.

The new owner should learn that each line circuit equipment is a unit to itself and that troubles of a general nature are more likely to be found elsewhere as, for instance, in the main office ground. Also that each cord circuit is a unit to itself so far as connections are concerned and that a metallic cord circuit is always ready to connect two lines, provided that, if these are single wire circuits, the same side of both switchboard drops be grounded, and provided the cords are put on so that the tips connect through to tips and sleeves to sleeves.

The function of repeating coils in connecting to metallic toll lines must be thoroughly understood. And it should be seen to that the operator does not fail to use repeating coil cord circuits when connecting grounded lines to metallic toll lines, in case the manufacturer has not made it mechanically impossible to put up such connections without using a repeating coil.

The proper testing of cords and cord circuits should receive early attention, as no other one thing has such a salutary effect on the quality and reliability of the service.

The time honored system of using battery on an open jack to test cords with the regular operator's set, is an efficient test for both cords, in the case of single supervisory circuits, but can be used only on one cord of each pair in the case of double supervisory circuits or those having repeating coils. It is, therefore, better to use for testing purposes a current which will pass through repeating coils and condensers and possess as closely as possible all the characteristics of voice current.

Such artificial voice current can be had by setting a buzzer up close so that it will vibrate at an extremely high frequency and connecting it in series with a dry cell and the primary of an induction coil. This gives a tone which can be reduced to any desired volume by shunting the secondary with a few inches of fine German silver wire or an equivalent resistance in copper magnet wire.

This high frequency low voltage tone will be completely interrupted by any break in the cord current which would interrupt voice current itself, whereas ringing current or "tone" from an unshunted source would fail to reveal bad key contacts and similar sources of trouble.

The "tone" should be permanently connected to a jack with extra contacts which close the battery circuit and start the buzzer on the insertion of a plug. An observing receiver should be connected to another jack and the cord circuit tested complete and just as it is used to connect two subscribers.

By wearing the observing receiver on one ear, and the regular operator's receiver on the other, one can test all functions of the key equipment and determine the exact amount of pressure necessary to unseat the various contacts and produce cutouts.

Even where ordinary battery current is used for testing single supervisory cord circuits it is far better to use two jacks and two receivers, allowing one receiver to represent the operator and the other the distant subscriber. This makes it possible to test the continuity of the cord circuit with the listening key normal as well as with it tilted.

But while "tone" is better for testing cord circuits, dry battery current can be used to excellent advantage in locating telephone trouble. The battery is already in place for testing the primary circuit and by fingering the transmitter cords and the primary circuit connections, a frying noise will promptly betray the point of weakness when it is touched. But so many troublemen do not seem to know that the secondary circuit can be tested out in like manner by connecting the battery to the line binding posts and, in the case of farm line sets, short circuiting the condenser, if present.

Leaving one cell of battery on the transmitter and connecting the other cell to the line binding posts, as suggested, puts battery through every wire and connection in both transmitter and receiver circuits and a defective receiver cord or any other faulty connection will instantly respond with a scratchy noise when touched.

All of the foregoing suggestions cover what may be termed *qualitative* tests, in that they determine the existence of wrong conditions rather than their extent. These qualitative tests should be thoroughly mastered as they are even more valuable to the small exchange owner than the quantitative or measurement tests which are less frequently employed.

The Value of a Testing Voltmeter.

But as soon as the first principles of telephone equipment have been mastered, nothing will so serve to stimulate interest and the continuance of telephone research or prove a better investment than the purchase of a low resistance testing voltmeter.

This instrument with two dry cells should be connected to a testing plug which can be inserted into any line jack, causing the voltmeter to register the combined resistance of the line and telephone.

The legitimate resistance of short exchange lines with a single 1,000-ohm telephone should not exceed 1,300 ohms, which allows 200 ohms for a strong loop mile of cable or even No. 14 steel wire and 100 ohms to cover imperfect joints and the

few ohms which the ringers may vary. Single wire grounded lines should be held to the same 300-ohm limit in excess of ringer resistance, for this allows over 200 ohms for faulty connections and ground rod resistance which should be kept within this limit—notwithstanding the fact that extension surveys made only a few years ago found the average telephone ground with a resistance of approximately 550 ohms, equivalent to more than ten miles of No. 14 and more than 15 miles of No. 12 B. B. iron wire. This means that every farm line telephone employing such a ground is in reality at the end of a 15-mile spur, which readily explains the difficulty encountered in ringing the entire line as soon as it acquires a carbon smut ground or other non-inductive shunt to earth.

Exchange lines with 80-ohm telephones should not show more than 400 ohms, including the telephone when measured from the central office. If the equipment comprises a mixture of 80 and 1,000-ohm telephones, lines showing resistances between 1,000 and 1,300 ohms must not be O. K.'d until we are sure the telephone is not an 80-ohm instrument. When such readings are encountered on the first test, the subscriber should be rung and if the voltmeter needle jumps up several points when he answers, it indicates a 1,000-ohm ringer. But if the voltmeter needle changes its position only slightly one way or the other when the party answers, it indicates an 80-ohm ringer and the presence of some 900 ohms of illicit resistance.

Owing to their multitudinous branches, farm lines cannot be figured in this manner; but it is very important for every exchange to have a record of the normal fair weather reading of all farm and toll lines, so that a comparative reading can be made whenever one of the lines seems to be in trouble. If the voltmeter then shows a heavier deflection it indicates the presence of a ground, while if it shows a lighter deflection it indicates the presence of a bad joint close to the office or that a part of the telephones on the line have been cut off by a break.

Testing Rural Lines.

Regular tests should be made on country lines at least once a year and during fair weather so that any changes in their normal condition may be noted. In this manner gradual increases in any point resistances can be noted and checked, for they will usually be found right in town where bad smoke conditions prevail.

A very valuable voltmeter test on both city and rural lines can be made during a wind storm when loose connections, cut-outs and swinging crosses are bound to show up in the tremulous and jerky action of the voltmeter needle. For all these tests a low resistance three-volt meter using two ordinary dry cells is recommended in preference to the more expensive high resistance meters using 30 volts of battery or more. The latter instruments are very valuable for making insulation tests on metallic toll lines but are not suited to the low resistance conductivity tests with which the small exchange is now concerned, since insulation tests cannot be made on grounded lines without opening the circuit at the telephone.

The three-volt meter above recommended should have a resistance in the neighborhood of 200 ohms and an ohm scale for three volts should be marked on the instrument itself or furnished in an accompanying table. The three-volt instruments are usually provided with 30 scale divisions and as a quarter of a scale division indicates approximately 25,000 ohms, they are sufficiently sensitive for any small exchange insulation tests in addition to their extreme adaptability to the more important conductivity tests.

These testing voltmeters are also offered with an ammeter scale, an addition which is very valuable for testing newly purchased dry batteries and also for testing line joints. This latter test is so easily accomplished that it is surprising it is not more frequently used. A lightweight pike pole or tree trimmer handle is provided with two galvanized hooks, a foot apart, which are wired to a dry cell and ammeter carried by the observer. It is only necessary to drive over the line, or rather drive under it, and test old wire joints by hooking onto the line wire on each side and noting if the ammeter or battery gauge shows any deflection.

On testing a country system in this manner a prospective purchaser was recently saved from a bad bargain by being able to locate only 18 miles of wire out of several hundred that had not deteriorated into extremely bad condition, requiring early replacement if good service was to be given. There is no good reason why more such tests should not be made as the usual "pig in a poke" purchase practice tends to level plants to so much per station regardless of the degree of depreciation and is unfair to buyers and sellers alike. When the pike pole is not available, two ordinary cane fish poles with hooks of No. 12 B. B. wire at their tops furnish an entirely satisfactory and always available substitute.

Testing Dry Cells.

A great deal of misunderstanding seems to exist relative to what tests should be made on dry cells, to determine when they should be removed from transmitter service. The specifications of one prominent manufacturer require a battery that will show 2.8 volts when on duty in the transmitter circuit. This requirement is far too severe, as a pair of brand new dry cells in perfect condition will barely pass it and would have to be changed every few weeks to be kept up to this standard, which really amounts to a requirement that three dry cells be used.

The writer's idea would be to use two dry cells only and not discard them until they fail to show 1.6 volts per pair while connected to a 22-ohm transmitter circuit. As transmitters vary in resistance, it is advisable to use a 25-ohm shunt on the voltmeter when measuring used batteries, as this causes the battery to show what it can do on a transmitter circuit of approximately 22 ohms' resistance. However, owing to the greater ability of certain transmitters to talk well on weak battery, the writer believes a side tone ear test with the telephone short-circuited to be preferable for small plants. Straight voltmeter or ammeter tests should not be used, as neither is indicative of a battery's ability to furnish good transmission.

Test for Ringing Pole Changer Batteries.

Ringing pole changer batteries should be tested by their ability to light a 60-watt, 110-volt carbon lamp and even when a high range voltmeter is available, the battery should be tested while shunted by the lamp. This test reveals the presence of dried out cells which will not show up on a straight voltmeter test. A strong low resistance battery is a first requisite to good ringing but does not mean that a good ringing current will be furnished, as 40 dry cells with a pole changer in perfect adjustment will give far better ringing than will 80 dry cells with a pole changer adjusted improperly.

Many of the larger exchanges are using high-priced alternating current voltmeters for testing ringing current, but the writer considers these almost valueless in the case of pole changer equipment for the reason that the most perfect alternating current voltmeter obtainable will not reveal the unbalanced current wave condition which is the real cause of 95 per cent. of all ringing trouble. The alternating current voltmeter merely shows the combined strength of the two sets of current waves, but if, as frequently happens, two-thirds of this total strength is in one direction and only one-third in the other direction, we will be slamming bell tappers to the right with twice as strong a current as we have available to coax them back to the left. And under such conditions bad ringing will result regardless of the make of telephones or pole changers used and regardless of the amount of ringing battery which is burned up.

Instead of the high-priced voltmeter, the writer has always

(*Concluded on page* 29.)

Some Work Ahead

Many Panaceas—Washington Life—Time to Act

By J. C. Kelsey

Nearly seventeen years ago, I saw the first copy of TELEPHONY. To me, a switchboard man then, it seemed a gift from Heaven, for at that time free speech was still a dream of the telephone man.

Today, it is interesting to read down the lane of nearly seventeen years to the present. You will realize that many of our leaders have died, others have sold their interests, and many others have ceased to take part in our national councils.

Conventions have come and gone. Convention papers by the thousands have been read. Thousands of ideas have been advanced and each author of an idea cast it before his fellow man feeling that he had found the Utopian pathway.

Thousands of predictions were made. Some set the date of the burial of the Bell company and others showed the patient in a state of invalidism, while bankers and investors thronged the pathway to investment in the Independent telephone industry.

As a matter of fact, no industry ever had more bankers and investors than our very own. We went through all manner of plans for telephone banks, security companies and other means of saving our lives. And all through the seventeen years, men worried uselessly over a great and wonderful business.

Years ago, men came forward with ideas of publicity. Unless we had a nation-wide answer to the Bell advertising campaign, we should be ever lost. But nothing ever came of the great nation-wide publicity campaign, nor did the banks or security houses ever materialize.

The simple truth of the matter was that we did not need them as much as we thought. Had all these things been really needed, the industry would have had them long ago.

We have seen associations flourish and decline, only to flourish again. We have learned in seventeen years that it is men's interest which declines, and nothing in the association at all. The very moment the old crowd, which has lost interest, has wit enough to quit, the new crowd jumps quickly into the traces and rejuvenation begins at once. It is all natural enough.

As the old crowd retires, we hear vague mutterings that Independent telephony is dead and that nothing remains but a call for the undertaker. But year after year, the great industry goes on, changing according to economic law and improving in strength as it meets the new conditions.

After a storm, it seems quieter than it really is. After we had passed through the storm of the early promoters, it naturally seemed more quiet. But does anyone imagine for one moment that the national association of 1905 was any more effective than our association of 1916?

Does anyone imagine that there is less power behind the 1916 association than the 1905 association? Does anyone imagine that, because the loud noise is stilled, there are fewer telephones and fewer dollars of investment behind our quiet and effective association?

Does anyone, looking back on association work, believe any real progress was made during the years in which the only work done was to pass resolutions against a lone Independent telephone manufacturer which was accused of Bell ownership? Does anyone believe that hostile resolution will help anybody or anything?

Only last week a large order was placed unexpectedly because the buyer objected to what he called knocking. Every Independent telephone man knows what this means and how ineffective it is. It is safe to say every telephone man in his own heart knows that we are stronger in association work today than ever before, simply because it operates on a strict business basis.

Our national associations have wasted many years in and around Chicago. Chicago never was an Independent telephone city and it has never been in sympathy for one moment with anything the association has done. It is all very well to have conventions at this great central point on the ground of economy, but the location, as an association center, has ever been wasteful.

The new laws which have put us under Washington control, make Washington the natural home of the association for all time—that is, if real effective and useful work is to be done and the association appreciated by the companies as it should be.

Washington is a curious place. It is made curious because it is the home of the political activities of the nation. The average man, doing business in the average way, has no conception of the manner in which our national business is conducted.

If he has business in Chicago, he can handle it intelligently and go home feeling that he has accomplished some actuality. But let Mr. Average Man go to Washington to do some business, or have some condition corrected, and he is as helpless as a child. All he can do is to consult specialists or men who know Washington ways and the way can be cleared in a moment's time.

In other words, Independent telephony never made real progress until it got accustomed to Washington ways by placing its association there.

Owing to the peculiarities of Washington, ordinary business has little chance of success.

Suppose some banking measure is up—your bank telegraphs, and 7,599 other national banks telegraph the various senators and congressmen. Nothing but confusion will take place unless the representatives of the bankers' association are present in concrete form.

In other words, a representative of the bankers' association at Washington, knowing its ways, can be more effective than 7,600 individual banks located elsewhere and having no personal individual representation in Washington.

The representative of the association, being on the ground, gives life and form to a protest which Washington will heed. It is true of our telephone life that a representative on the ground, familiar with Washington ways, backed up by your telegrams and letters, can do wonders through efforts which otherwise would be a waste of time.

It is safe to say that our Independent telephone association, with headquarters at Washington, backed by your telegrams and letters, can accomplish more in one week then our Bell contemporaries can handle in a year, if at all.

But back of it all, in spite of Washington, publicity and all other so-called panaceas, the one great requisite of telephone success is proper earnings. All through the years since 1900, too little has been said about the evils of the dollar telephone.

Instead of hostile resolutions and quarrels over ways of doing things, we should have driven home the organic necessity of making our telephones earn enough to pay returns and perpetuate themselves. All the publicity in the world, all the legislative influence possible, will not help a telephone company which cannot work out its own economic salvation.

Associations, conventions, and kindred things are rather the dessert of our telephone existence—they are to all intents and purposes a sort of a luxury. But the bread and meat of our business is the collection of enough money to pay expenses and dividends and to set aside enough to immortalize the property.

Investments should be immortal. They should live on forever or as long as you or your estate demands, and be worth dollar for dollar any hour that you care to sell.

We have seen the druggist, butcher, grocer, drygoods man and restauranteur boldly raise their prices. We have recently seen railway employes enforce a demand for shorter hours and more money. We have seen men strike for more money and get it.

The telephone company gives service to every one of these. It never slumbers nor sleeps, and never discusses eight hours or any hour under twenty-four. Is there any reason in the world why you cannot leer over your counter and make a smirking remark about the European war raising the price of your product? If you don't do it now, you are lacking in spine and deserve your handicaps.

If every Independent telephone company merely imitated the butcher, grocer, engineer, conductor, and in fact every subscriber it has you would have no complaint about anything. You would have money enough to buy new telephones and switchboards, pay dividends, contribute to your association and subscribe for your trade papers as you should.

We would need no publicity or priest, and our heads would go high with pride. We would all be happy. No industry ever had such great opportunity as the telephone business.

One telephone man recently wrote: "We have been reading your articles about the kinds of fools we are for giving telephone service for $1 per month, and have decided to take up the matter of a rate raise."

One thing worried these people. That was the expense of making an inventory and presenting the case to the commission. Another thing was an inclination not to stir up the people and make useless trouble.

The first of the two worries is easy, for the expense of a rate case is a normal one and the public must pay for the privilege of disputing the raise. The second of the two is much simpler because the people are far more accustomed to raises now than at any other time of their existence.

Even the public utility commissioners, their engineers and auditors, need no introduction to the butcher, grocer and druggist theory. Every one of them has been held up at every turn, and no one needs a reminder of the fact. They need little additional education in the theory of a rate increase because it has become a habit.

All I can say is that the company which does not take advantage of the situation is fearfully and woefully lacking in business ability.

We need no quack remedies. We do not need to fill the Ladies Home Journal with advertisements about our business. We do not need a benevolent government to control our great enemy.

We could easily get along without Wall Street and yet raise millions of dollars quickly, if we demonstrated, in each locality, our determination to get a rate which will pay interest and take care of the rust. Banks, security dealers, and all investment houses in America would dog our footsteps if we would but demonstrate our courage in taking up the gauntlet of proper income.

In all these seventeen years of history, interesting as they are in every detail, the one permanent curative panacea stands out—*proper telephone rates.*

Do you realize what a gift to the human race this telephone service is? Do you fully realize what blessings you have conferred upon humanity, not only from the sentimental standpoint, but from the deadly practical one? In cold dollars and cents, even, the human race has made more profit with your telephone than any other device. Be brave enough to ask to share in it—you are entitled to it.

If the telephone company earned proper rates, your stockholders would not vote to sell. It is a saying, at least in the restaurant business that "For Sale" means it is not worth buying. Likewise a telephone company "for sale" is not worth buying, unless some other motive is present.

The best part of it all is that the time is ripe for placing telephone properties in their proper niche. Do not hesitate.

MORAL: A laborer is worthy of his hire.

Proceedings Before Commissions, Courts and Councils

Discussions and Rulings of State Bodies Having Supervision Over Telephone Companies, Decisions of Courts in Matters of Interest to Public Utilities and Actions of City Councils Relative to Franchises, Rates and Service

Installation and Inspection of Telephones in Chicago.

Wm. G. Keith, commissioner of electricity of the city of Chicago, has authorized W. N. Furthmann, of Chicago, to prepare a set of rules and regulations and a proposed ordinance covering the installation and inspection of telephones and telephone exchanges and private branch exchanges in the city. Mr. Keith has determined that the present method of installation forms a very liable risk to property and human life.

Mr. Furthmann has made reports and tests which were demonstrated to the commissioner. Following are the conditions he found in Chicago in regard to the installation and use of telephones:

1. Due to the use of 110-volt ringing current, it would be possible to so arrange a telephone for combustion that a subscriber in having his number called by the central office operator, could bring about a fire or explosion.
2. The same condition is present with a measured service

meter, only the meter is installed in a steel box and locked.

3. By means of a flashlight powder across the carbon blocks and lightning arrester, it would be possible to start an explosion outside of a building, basement, or terminal room.

4. Private branch exchange systems and cable therefor are made of highly inflammable material using beeswax and varnish as a compound. These systems are not at present inspected by the city, although storage batteries, motors, and generators that are used with such systems, are.

5. It is the present practice in all cases to install telephones without using conduit or metal molding, the wire being set in a haphazard manner with staples. The telephone wires are placed around highly inflammable materials, such as curtains, portieres, etc.

6. Due to the use of grounded circuits and the location of the telephones near radiators or other piping, or in close proximity to electric light outlet boxes or lighting boxes, a very easy means is afforded of obtaining a severe shock with a 110-volt circuit which is grounded.

It is the purpose of the commissioner of electricity, Mr. Keith, to take up with the other commissioners of electricity in other large cities the points involved and make a national proposition out of what is believed to be a menace to property and human life.

Wisconsin Commission on Competition and Duplication.

In finding that public convenience and necessity do not require extension of telephone lines by the La crosse Interurban Telephone Co. in the town of Campbell, La Crosse county, the Wisconsin Railroad Commission has held that present duplication in that territory would be materially increased should the petition be granted.

Referring to present duplication there, the decision says: "The proposed extension would only aggravate that condition. While the effect on the investment of the existing utility may properly be considered, the primary purpose of Chapter 610 of the laws of 1913 is to prevent the economic loss of the public which always results from duplication of equipment. To that end paralleling is forbidden except in those cases where the commission is able to find that public convenience and necessity require it.

Instead of permitting unrestricted competition in this field, the present legislative policy is to confine each utility so far as possible to operate in its own and extensions into unoccupied territory, and to afford means of intercommunication between specific units by the establishment of physical connection. That method usually makes available to the subscriber every facility which the competing line could bring to his door, with none of the evils attendant upon unrestricted competition.

It is the remedy that should be first sought in situations like the present one. While the merits and possibilities of a physical connection are not before the commission in this case, it is enough to say that, so long as the remedy is available to the subscribers of these companies, it can not be deemed necessary to complicate still further an admittedly confused situation by resorting to additional duplication."

Chicago Automatic Case Before U. S. Attorney General.

The completion of the sale of the Chicago automatic telephone system by the Illinois Tunnel Co. to the Chicago Telephone Co. was bitterly contested last week in the office of George Carroll Todd, acting attorney general at Washington, D. C., by Attorney Frank T. O'Hair, representing the Independent companies in eastern Illinois and western Indiana, F. C. Stevens representing the Tri-State Telephone & Telegraph Co., of St. Paul, Minn., and B. A. Campbell representing the Kinloch Long Distance Telephone Co., of St. Louis.

The Independents present at the hearing state that unless they are given the same connections with Chicago as they now have with the automatic company, they will fight the sale on the ground that it is a violation of the Bell agreement with the Department of Justice.

Telephone Line as an Incumbrance.

The existence of a public highway over land agreed to be conveyed or the existence in the highway of sewers, water mains, and gas pipes incidental to its use for highway purposes are not incumbrances of which the purchaser can complain. A line of telephone poles, wires, or fixtures placed in a highway in front of abutting property under grant from the owner thereof, however, is a violation of a covenant for a conveyance or fee.

The fact that the existence of a telephone line in the highway in front of land was a visible construction upon the highway which the purchaser of abutting land might have seen at the time of the contract was no defense against his claim for damages for the vendor's breach by reason of such incumbrances. Fossume vs. Requa; Court of Appeals of New York; 113 Northeastern, 330.

Interference with Telephone Wires by Moving House.

The right to use the highways for moving buildings exists independently of statute, being a natural right which may be exercised unless restricted by statute or ordinance. Injunctive relief will be denied a telephone company incorporated under Transportation Corporations Law of New York, section 102, to restrain persons moving a house 29 feet along the highway, after having secured a permit as prescribed by the Highway law, section 53a, as added by the laws of 1910, chapter 567, from interfering with the telephone company's wires strung along the highway 19 feet above the ground, since the removal of the building is a reasonable use of the highway, and cutting the wires will not irreparably damage the company. New York Telephone Co. vs. Dittman; Supreme Court of New York; 159 New York Supplement, 625.

Use of Railroad Right of Way.

A contract between a railroad company and a telegraph company for use of the railroad company's rights of way by the telegraph company, declared that it should cover and embrace all rights of way owned, leased, controlled, or operated by the railroad company, and should include any branch or branches that might be constructed, or other railroads that might be acquired by the company by lease or purchase. The court held that such contract extended to another line of railroad acquired by the railroad company, and fixed the rights of the parties thereto, notwithstanding the telegraph company, at the time of acquisition, had a contract with the owner of the line of railroad acquired. Western Union Telegraph Co. vs. Nashville, Chattanooga & St. Louis Railway Co.; United States District Court, Georgia; 233 Federal, 605.

Effective Date of Section 10 of Clayton Act Extended.

Senate Joint Resolution 129 extending the effective date of Section 10 of the Clayton act, relative to the purchase of common carriers, has been passed by both houses and approved by the President. The act was passed October 15, 1914 and was to have become effective two years from that date. Under the amendment recently passed, however, the effective date of Section 10 of that act has been extended to April 15, 1917.

Power to Control Charges.

A contract or agreement made in a franchise ordinance by which are determined the maximum rates to be charged by a telephone company for the use of telephones by the

inhabitants of the city, is made subject to the right of regulation. Since the adoption of the constitutional amendment creating the Nebraska State Railway Commission and the passage of the law specifying the duties of the commission, that body has power to regulate the rates charged for the use of telephones in cities of the second class.

The statute provides that, in appeals from the decision of the railway commission in the matter of rates or charges, such a decision is prima facie evidence that the rates fixed are just and reasonable, and such rates shall remain until annulled, modified, or revised by the commission, or until finally adjudged to be unreasonable and unjust in a court of competent jurisdiction.

Evidence was examined by the court which held that the rate of $2.50 per month allowed by the state railway commission to be charged for the use of a telephone for business purposes in the city of Stromsburg has not been shown to be unreasonable and unjust. Marquis vs. Polk County Telephone Co.; Supreme Court of Nebraska; 158 Northwestern, 927.

Summary of State Commission Hearings and Rulings.

ALABAMA.

September 6: Hearing on the complaint of the city of Birmingham, Ala., against the alleged excessive rates and discriminatory practices of the Southern Bell Telephone & Telegraph Co.

CALIFORNIA.

August: The commission authorized the Roseville Telephone Co. to issue 83 shares of stock at par to provide for improvements and betterments.

August: Application filed by the Hughson Telephone Co., of Hughson, Cal., for permission to sell its plant to the Pacific Telephone & Telegraph Co. for $7,800.

COLORADO.

September 5: Continued hearing on the investigation into the reasonableness of the rates and adequacy of the service of the Mountain States Telephone & Telegraph Co. in the state of Colorado.

ILLINOIS.

August: The commission denied the application of the Farmers Telephone Co., of Sandwich, Ill., for permission to build lines in the territory now served by the Northern Illinois Telephone Co., holding that there was no public need for another line.

INDIANA.

August 28: Hearing on the complaint of the Citizens New Telephone Co., of Ellettsville, against the Central Union Telephone Co. The complaint asks for a reduction in the present charges for connection with the Central Union lines in Bloomington.

KANSAS.

September 12: Postponed hearing on application of the Missouri & Kansas Telephone Co. for permission to increase its rates at Wellington, Kan.

MINNESOTA.

September 15: Hearing in the village hall at Walker, Minn., on the application of the Walker Telephone Co. for permission to increase its individual line residence rates from $1 to $1.50 per month and its party line residence rates from $1 to $1.25 per month. The company alleges that it has recently expended $3,000 in the converting of its local exchange from a grounded to a metallic system and for other general improvements, and in order to secure a reasonable return on the investment and furnish continuous 24-hour service, it is necessary to increase its rates, as previously stated. Case M—103.

MISSOURI.

September 11: Hearing at which the Alton-Slater Water Co. will be given an opportunity to show cause why the commission's order of April 24 should not be set aside or modified by attaching such conditions thereto as shall require the company to install and operate its transmission line in such a manner as will protect the public traveling on the highway and using the telephone system of the complainant (the Gilliam Telephone Co., of Gilliam, Mo.) from injury by high voltage current.

September 18: Hearing in the matter of adopting a uniform system of accounts for telephone companies. Every telephone company in the state has been given notice that it will be expected to be present or to be represented, and to introduce any evidence necessary to assist in the promulgating of a uniform system of accounts for telephone companies. Case 937.

September 18: General conference in which representatives of all telephone companies in the state are to meet with the commission and to introduce all testimony and evidence required in the adoption of uniform rules, regulations and practices.

NEBRASKA.

August: Complaint filed by telephone users of Yutan, Neb., against the Lincoln Telephone & Telegraph Co., claiming that the increase in rural rates at Yutan, allowed by the commission some time ago, was obtained by fraudulent means and by misrepresentations.

August 25: Hearing on application of the Callaway Telephone Co. for permission to discontinue service to privately-owned telephones within the village of Callaway.

WEST VIRGINIA.

September 12: Hearing on the application of the four Bell telephone companies of West Virginia for a proposed consolidation. The companies include the Consolidated Telephone Co. of West Virginia, with offices in Wheeling; the Chesapeake & Potomac Telephone Co. of West Virginia; the Central District Telephone Co. and the Chesapeake & Potomac Telephone Co. of New York. These companies have 45,000 Bell stations in West Virginia. The proposed name for the merged companies is The Chesapeake & Potomac Telephone Co. of West Virginia. Protests against the merger may be filed by any subscriber or citizens of the state.

WISCONSIN.

September: The commission denied the petition of the La Crosse Interurban Telephone Co. for permission to extend its lines into the town of Campbell, La Crosse county, Wis., holding that the present duplication in that territory would be materially increased should the petition be granted.

September: Permission granted by the commission for the issuance of $15,000 of stock by the La Crosse (Wis.) Telephone Co. to pay for additions and extensions, including the construction of additional central office accommodations.

September: The Chippewa County Telephone Co. petitioned the commission for permission to extend its lines in the towns of Anson and Tilden, Chippewa county. Competing companies interested are the Cadott Telephone Co. and the Wisconsin Telephone Co.

September: By action of the commission, the Owen Telephone Co. is allowed to extend its lines in the town of Hoard, Clark county, and the Wisconsin Telephone Co. to extend its lines in the town of York, Columbia county.

September: Complaint filed relative to an investigation on the commission's motion of the rates and charges of the Bell Telephone Mfg. Co., of Hayward, Wis.

September: Complaints filed relative to deficient service by the Bashow Valley Telephone Co. and the Northern Telephone Co., Woodruff, Wis. Biersach & Niedermeyer, Milwaukee, also filed complaint against the Wisconsin Telephone Co. for alleged refusal to install equipment.

September: The Crivitz Rural Telephone Co. filed a switching rate of 30 cents a month per telephone.

September: The Tri-State Telephone & Telegraph Co. filed a reduction in the other line charge for Cornucopia, Wis., from 45 to 40 cents.

September: The Theresa Union Telephone Co. filed a complaint against the East Valley Telephone Co. alleging violation of the anti-duplication law.

September 7: Hearing at the village hall of Greenleaf, Wis., in the case of Edwin J. Groth, et al., vs. the Manitowoc & Western Telephone Co. and the Wisconsin Telephone Co. relative to the discontinuance of service. U—966.

September 19: Hearing at the city hall of Hudson, Wis., in the case of the American Society of Equity vs. the St. Croix Telephone Co., et al., relative to other line charges. U—905.

September 19: Hearing on application of the Marshfield Telephone Exchange for authority to adjust and increase rates. U—863.

September 19: Hearing on application of the Osceola Farmers Mutual Telephone Co. for authority to increase rates. U—868.

September 20: Hearing on application of the August Light & Telephone Co. for authority to increase rates. U—901.

September 21: Hearing at Maiden Rock, Wis., on the application of the Maiden Rock & Esdaile Telephone Co. and the Lake Pepin Telephone Co. for authority to adjust toll rates and for an order providing for a division of toll revenue among the various companies over whose lines such messages are routed. U—961.

September 26: Hearing at Westfield, Wis., in regard to the adjustment of rates for interchange of service between the Westfield Farmers Telephone Co., the Coloma Telephone Co. and the Marquette & Adams County Telephone Co. U—967.

Resistance of Carbon Contact in Solid Back Transmitter

Discussion of the Variations in the Resistance of the Ordinary Solid Back Transmitters With the Time and Applied Electromotive Force, and Their Cause as Indicated by Experiments—Abstract of an Article in The Physical Review

By A. L. Clark

That the resistance of ordinary solid back telephone transmitters varies with the time and applied electromotive force, has been known ever since such transmitters have been used, but the cause of these variations as well as their astonishing regularity have not been adequately discussed—at least not to the knowledge of the writer. They are generally regarded as of a more or less erratic and uncertain character.

The essentials of a transmitter of the so-called solid back type consist of a cylindrical brass capsule, having one end closed and the other open. The cylindrical wall is covered inside with a thin layer of insulating material (usually paper), and the bottom is covered with a disc of carbon securely attached to the brass end of the capsule. The other end of the capsule is covered with a second carbon disc, mounted on a thin mica plate and held in place by a brass ring. The capsule is nearly full of carbon grains, which close the electrical circuit between the two carbon discs. The mica mounted disc is attached to the diaphragm of the transmitter and vibrates with it, when it is acted upon by sound waves. If a solid back transmitter whose front disc is given sufficient elastic free-

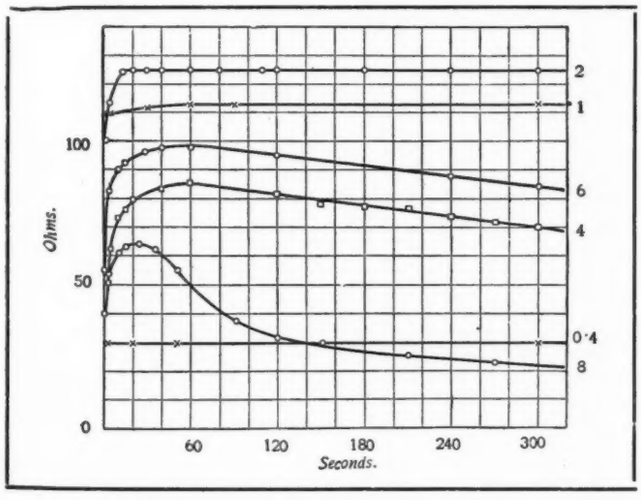


Fig. 1. Changes in Resistance with Time.

dom of motion, is placed in an electrical circuit where the potential difference between its plates is a few volts, the following phenomena are observed:

The resistance rises at first—in some cases as much as 100 per cent. or more—and then falls off more slowly. The rapidity of the rise in the earlier part of the experiment as well as the amount of rise, and later, the rapidity of the fall in resistance depend on the current density through the apparatus, being greater for large currents than for small. The changes in resistance with time are shown in Fig. 1. It will be seen that the initial value of the resistance is largely a matter of accident, depending on the arrangement of the grains and the pressure with which they are held together. The time is given in seconds and the resistance in ohms. This is true for all the curves showing time relations.

The explanation of the phenomena observed above is as follows: In the upper part of the transmitter the current passes between points in loose contact, while in the lower part the contacts are tight. According to the results of previous experiments, the resistance of the contacts in the upper part of the capsule is increased when the current passes, while in the lower part there is very little change. Consequently, when the current is first turned on, the resistance rises; but after a certain time the heating of the granules causes increased pressure and shifting of points of contact which reduces the resist-

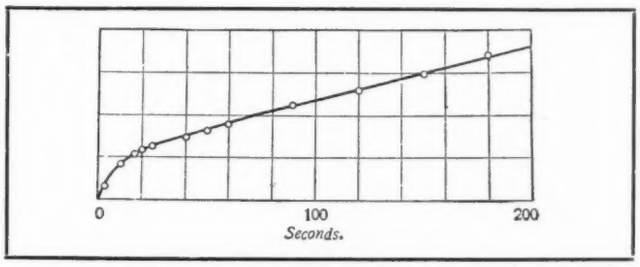


Fig. 2. Expansion of Carbon Points of Contact with the Time.

ance again. No doubt a part of this later decrease is due to the fact that the temperature coefficient of carbon is negative. Thus we have two causes operating together, viz., the increase due to the loose contact effect and the increase of pressure due to expansion. The former predominates at first, but is overtaken by the latter. If the transmitter be jarred during the observation, the resistance drops back to nearly its initial value and the changes in resistance occur over again.

The phenomena have an additional complication when the carbon granules are enclosed in a capsule all of whose walls are rigid. This rigidity may be effected by clamping so that the front mica disc is held firmly, or this disc may be held with wax. In this case the points of contact which are suddenly heated by the current, expand, causing an increase in pressure between the grains, giving rise to a rapid decrease in resistance. This initial rise is soon overtaken by the increase of loose contact resistance which in turn is overtaken by the expansion due to the general rise in temperature. The initial decrease in resistance which appears when the ends of the capsules are rigidly held is seldom noticed in the ordinary use of the transmitter, because the elasticity of the mica plate holding the front carbon disc does not allow the pressure to increase so rapidly. In other words, in the ordinary use of the transmitter, the loose contact resistance *increases* so much more rapidly than the *decrease* due to the expansion of the points, that the resistance rises instead of falls.

The method employed in the measurement of the resistance was a simple ammeter-voltmeter method, with dead-beat instru-

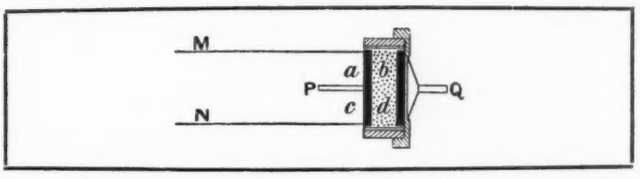


Fig. 3. Arrangement for Showing Initial Rise of Temperature.

ments which were read at short intervals. The transmitter was connected directly to a storage battery so that the applied electromotive force remained constant.

That the sudden expansion of the grains previously mentioned, actually occurs, was shown by the following experiment: The capsule was rigidly mounted in a clamp so that as a whole

it was immovable and an optical lever with a very short arm was attached to the front disc. The current was turned on and the expansion noted with a telescope and scale. The system was arranged so that the magnification was about 1,000. Fig. 2 shows the expansion with the time. The ordinates are

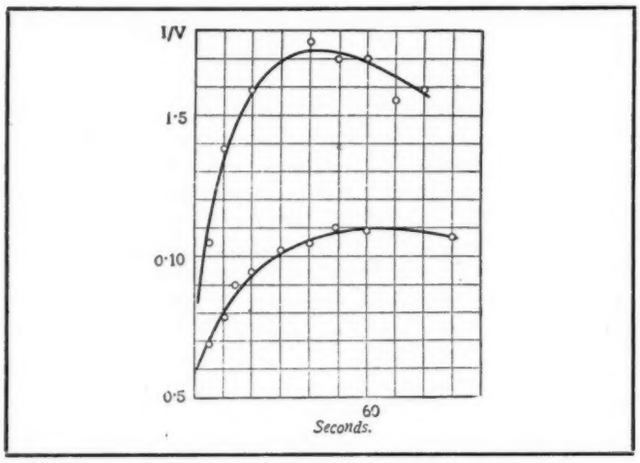


Fig. 4. Curve Showing Way in Which I/V Changes with Time.

thousandths of millimeters. It will be noticed that the expansion is most rapid at the beginning and appears soon enough to make the explanation of the initial drop referred to previously, acceptable. The curves vary greatly, according to the rigidity of the carbon disc and the size of grains used.

That the explanation of the initial rise in resistance in the curve of Fig. 1 is correct, was shown with the arrangement shown in Fig. 3, consisting of a hollow brass cylinder with a carbon disc stuck onto the back with sealing wax insulating it from the brass. The front was covered with the ordinary mica mounted disc. A stiff copper wire, *P*, was soldered to the middle of this disc to convey the current and small wires, *M* and *N*, soldered to its top and bottom. These last wires were connected to a galvanometer through a resistance box. This box was placed in the circuit to control the deflection of the galvanometer. Thus the galvanometer may be used to measure the potential difference between the top and bottom of the disc to which they are connected. A battery and ammeter were connected to *P* and *Q*. It will be seen from the diagram of connections that we have virtually a Wheatstone bridge arrangement, the letters *a*, *b*, *c* and *d* referring to the various parts of the net, representing in each case the resistance of the part on which the letter is found. If a constant electromotive force be applied between *P* and *Q*, and *I* represents the total current measured by the ammeter, and *V* the potential difference between the top and bottom of the fixed carbon disc, shown by the galvanometer, it can be shown that an increase in the value of *b* causes an increase in *I/V*, and an increase in *d* causes a decrease in the value of *I/V*.

Fig. 4 shows the way in which *I/V* changes with the time. It will be noticed that *I/V* increases to a maximum and then diminishes. The initial rise in the value of *I/V* is due to either an increase in *b* or a decrease in *d*. If due to the latter, *I* should increase also, which is not the case. So the first change in *I/V* must be due to an increase in *b* or the loose contact effect in the upper half of the transmitter. The decline in *I/V* after the maximum value is due to either a decrease in *b* or an increase in *d*. If due to the former, it is caused, no doubt, by crowding of the grains with shifting, thus presenting new points of contact. If the decrease in *I/V* is due to an increase in *d*, it is caused by the loose contact effect extending into the lower part of the transmitter. Probably the latter cause operates first as the current does not begin to rise until after the maximum in *I/V*. The inequality of *a* and *c* are brought out in the two curves of Fig. 4. They represent the value of *I/V* for the two positions of the transmitter.

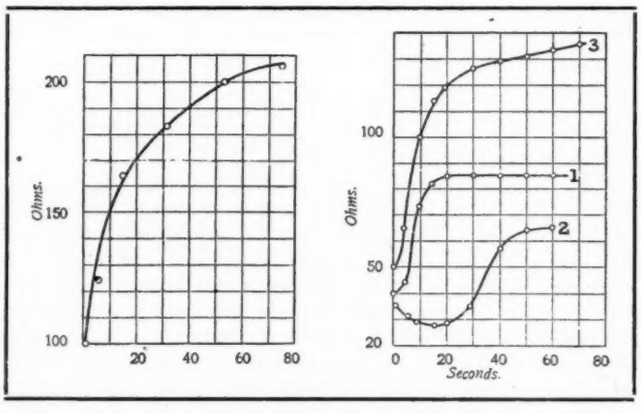
Two curves are given showing the effect on the resistance due to changing the electromotive force from 2 to 4 volts and back again. From these it is seen that an increase in current is always followed by an increase in resistance and a decrease in current by a decrease in resistance. The reason for the decrease in resistance is probably due to the shifting of the grains with the falling temperature. It has been proved beyond all question that a very slight change only in the position of contacts on the grains is necessary for restoration of the initial conductivity after the loose contact effect has occurred. The recovery of the transmitter after a run was also investigated.

In the case of a system of carbon grains, enclosed in a capsule with rigid walls or in an ordinary transmitter capsule where the front disc is clamped or fastened in any other way, the resistance rises rapidly at first and then falls off. No doubt this is due to the release of the pressure due to contraction attending the rapid cooling of the points of contact. If the pressure on the grains be increased in any way, such as by pressing on the mica-mounted disc, the resistance of the transmitter falls but quickly begins to rise again owing to the increased current. If the pressure be released, the resistance always rises but falls again immediately.

So we see that an ordinary solid back transmitter as commonly used is a partially conservative system, as far as its resistance is concerned. Anything which causes an increase in current is met by an increase in resistance which cuts down the current, while if the current be decreased in any way the resistance decreases, causing an increase of the current. The question whether or not the changes in resistance which occur with increase or decrease of pressure on the diaphragm take place quickly enough to affect the wave form when the transmitter is used in ordinary telephony, was examined, with the result that except possibly for sounds of very low pitch there can be little or no distortion due to the kind of changes just mentioned.

There is no evidence of a secular change in resistance when the transmitter is used continuously over a long interval of time. On the contrary, an experiment carried out for several days showed no sure change in resistance. A circuit breaker was arranged to make the current for 10 seconds once every minute and at the end of 48 hours the resistance curve was almost identical with the curve at the beginning of the experiment.

That the gas in which the transmitter grains are placed exercises a marked effect on their contact resistance, is shown by the following experiment. A transmitter capsule with a number of small orifices in the brass back and grooves in the



Figs. 5 and 6. Relations Between Transmitter Resistance and Air Pressure.

back of the carbon disc to allow circulation of the gas, was placed in a receiver from which the gas could be removed by pump. With air in the receiver the resistance curves were those of Fig. 1. (See also curve 1, Fig. 6.) When the air was pumped out the curves became like those of curve 2,

Fig. 6. When the air is removed so that the pressure is about 3 millimeters, the rise in resistance due to the loose contact effect is very small and the droop in the curve due to the sudden expansion becomes noticeable. As soon as the air was re-admitted the curve went back to the curve 1 class. In some of the trials the apparatus stood for several hours before measurements were taken in order that there should be no doubt that the air pressure inside the capsule was the same as the pressure in the receiver.

Fig. 5 shows the relation between the resistance of a transmitter and the air pressure. One thing that should be noticed is that at any given pressure the resistance is decreased by the passage of current which indicates that the escape of the air is facilitated by the heat generated at the points of contact. This effect was noticed in the previous experiments on carbon resistance. The effect of filling the receiver with oxygen is suggestive. When the transmitter is filled with oxygen the resistance curve rises with much greater rapidity and much higher than when it is filled with air and there is no trace of the drop in the curve shown in curve 2, Fig. 6. Here the resistance increases so rapidly that the inclination is much sharper than with air. This supports the suggestion made that the rise in resistance, in part at least, may be due to actual combustion with the formation of an ash or other material of permanently high resistance. Curve 3, Fig. 6, shows the resistance of an oxygen-filled transmitter. These experiments indicate that the gas at points of contact exercises more influence than is usually believed.

Thus far the work described has been on a transmitter which is kept perfectly quiet. The effect of a sound on the resistance of the transmitter is interesting. An ordinary central station instrument whose capsule is exactly like those employed in the previous experiments, was used. This was supended on spiral spring leading wires so that it was free from jar. The sound was produced by an organ pipe (256 vibrations) near the mouth piece of the transmitter. The phenomena exhibited by this instrument differ very little from those already described with a quiet transmitter, except that the changes in resistance are much less, as would be expected.

One interesting result was noted which shows again the conservative action of the transmitter. When the sound is turned on, the resistance of the transmitter is increased, due, no doubt, to the loosening effect of the vibration, but the resistance begins to decrease immediately. If the lip of the pipe is covered to stop the sound, but to leave other conditions unchanged, the resistance falls immediately but presently starts to rise again. The results of the foregoing experiments indicate that the theory of the action of the transmitter is not complete and that more than area of contact must be taken into account to explain the changes in resistance.

Picnic Enjoyed by Employes of Peninsular Telephone Co.

The Peninsular Telephone Co., of Tampa, Fla., held its annual picnic at Lake Padgett on Thursday, August 24. Under the management of President W. G. Brorein, who it is said is "some" picnic manager as well as telephone manager, everything went off without a hitch and the day was a great success.

The telephone system, which is of the automatic type, was left to take care of itself during the day and it is said that it did very well. Practically nothing went wrong and absence of the employes provided a good test of the equipment. With the automatic equipment, it was possible to vacate the offices and central station save for six operators.

Convention of Local Owners' Association of Texas.

Stanbery Alderman, secretary of the Local Owners' Telephone Association of Texas, has announced that the association will hold a convention at the Metropolitan Hotel, Fort Worth, Texas, on Wednesday and Thursday, October 25 and 26.

TECHNICAL MATTERS OF INTEREST.

(*Concluded from page 22.*)

recommended a test line in the office equipped with two ordinary extension bells having ringers stiffly biased in opposite directions. Using a four or five-bar hand generator turned at ordinary speed, set up both biasing springs as tight as possible without causing the ring to flutter and then keep the pole changer tuned up so it will ring both these bells. This insures a powerful and evenly balanced ringing current, because if the current waves become weak in either direction the corresponding bell will cease to ring. Most exchanges will find it advisable to set the bells to the strength of a four-bar generator, as a good five-bar hand generator sets too hot a pace for the average pole changer to follow and the writer has often found pole changers in use with heavily loaded rural lines which, before adjustment, could not budge test bells set up to the strength of a good three-bar generator.

Generalities being valueless, we have endeavored to touch in the foregoing a few of the technical matters of greatest interest to the small exchange owners in the hope that more of them will be induced to undertake the mastery of the simpler fundamentals of their business or will continue their efforts in this direction if they have already started.

Annual Report of Lincoln Telephone & Telegraph Co.

The earnings of the Lincoln Telephone & Telegraph Co., of Lincoln, Neb., during the fiscal year of 1915-16, ending June 30, reached the sum of $1,285,769, not including miscellaneous revenues from other than operating sources. The operating expenses were $826,889. This left $458,880 net revenue.

The company declared dividends amounting to $337,622 and paid interest on bonds to the amount of $49,136. The yearly surplus was $20,400.

The operating revenue increased $86,000, over the previous year. Operating expenses increased $63,000, and the net revenue was $23,000 greater, while $5,000 more went to surplus than in the preceding year.

The exchange revenue increased by $67,000, and toll revenue by $21,000, while there was a decrease of $2,000 in the miscellaneous revenue.

The company charged as depreciation reserve for the year $221,866 out of its earnings. It expended for ordinary repairs $83,251.

The company's stock now outstanding totals $5,684,837, and the bonded indebtedness is $1,202,000.

Earnings of Bell Company of Pennsylvania.

The Bell Telephone Co. of Pennsylvania reports a total operating revenue of $1,046,873 for the month of July, an increase of $124,268 over the same month of last year. The operating income was $266,940, an increase of $2,426. The earnings for the seven months ended July 31 compare with those of the same period during 1915, as follows:

Total operating revenue	$7,211,948	Increase,	$794,760
Total operating expenses	5,062,007	Increase,	738,491
Net operating revenue	$2,149,941	Increase,	$56,269
Uncollected revenue and taxes	307,644	Increase,	26,463
Operating income	$1,842,297	Increase,	$29,806

Injury Blamed on Telephone Wires.

Monroe Izor, a flour dealer of Cincinnati, Ohio, has sued the Cincinnati & Suburban Telephone Co. and the Union Central Life Insurance Co. for $10,000. He charges that the telephone wires were short circuited when the walls of his office were washed, and while he was using the telephone a tester was put on. He says his left ear and face were injured and he was in bed 19 days.

Fundamental Principles of the Telephone Business

A Reading Course Designed to Present Logically the Principles Which Underlie Successful Organization and Operation of Telephone Properties—Prepared Under the General Supervision of Stanley R. Edwards—Part I, Telephone Economics, by James H. Shoemaker, Completed June 26, 1915—Part II, The Corporate Telephone Organization, by J. C. Kelsey and S. R. Edwards, Completed September 25, 1915—Part III, Telephone Accounting and Auditing, by James H. Shoemaker, Completed January 15, 1916—Part IV, Telephone Finance, by J. C. Kelsey and S. R. Edwards, Completed June 3, 1916—Installments Now Being Presented Comprise Part V, Telephone Advertising and Publicity, Written by Roy D. Mock

Quiz Questions on the Preceding Installment.

58. Why should every advertisement have a specific appeal?

59. What is the purpose of presenting the criterions of telephone advertising?

60. State and discuss the first criterion which is given for telephone advertising.

61. Why should an advertisement be specific? Outline a test for specificness in a telephone advertisement.

CHAPTER VI. Criterions of Telephone Advertising (C'l'd).

62. *Pertinency of an Advertisement, the Third Criterion.*—The third criterion is framed as a question: Does the advertisement talk from the reader's point of view?

Every business man recognizes that the reasons one has for buying anything are radically different from the reasons one advances for selling anything. The reason a family orders telephone service installed is primarily because the members of that family want to be able to talk to their friends, to get up little social gatherings on short notice, to keep in closer touch with the social circles in which they move.

On the other hand, the reason a telephone manager or solicitor desires a telephone installed in a home is that he may have the additional income, and that he may have one more name in his directory and feel that his business is progressing.

It is thus quite apparent that the two groups of motives are very dissimilar. The shrewd business man recognizes this and keeps his own motives in the background as much as possible when selling merchandise or service. In other words, he climbs over to the consumer's side of the fence and talks to him about the advantages of telephone service.

Each telephone advertisement should likewise be written from the buyer's side of the argument. Sometimes the way to a buyer's purse strings is not as obvious as might be thought at first glance. Many a telephone has been installed not because the family particularly wanted to talk, but because the advent of a telephone meant the advance of one step up the social scale.

The third criterion then is this: Is this advertisement pertinent to the needs of the reader? In other words, does it talk from the standpoint of the user?

63. *The Fourth Criterion, Persistence.*—A great deal has heretofore been said regarding the advantages of advertising persistence, and in this thought is embraced the fourth criterion.

Naturally, it is difficult to imagine one advertisement standing by itself to include the quality of persistence. However, if a telephone advertisement helps carry out a definite plan of advertising—if it relates a principle to which the telephone company has been adhering for years—it can then be said to be a persistent advertisement.

It is difficult to win confidence. Someone has said that even the best of us cannot accumulate more than half a dozen good friends in the course of a lifetime. The reason underlying this statement is that friendship is a matter of confidence and it is a difficult matter to instill absolute confidence in any one's mind. In like manner, business confidence is slow in its growth. It is only through persistent advertising that a business reputation can be established which creates confidence and makes people desire to do business with this particular company.

Suggestions have been made in previous installments explaining how this quality of persistence can be developed and accentuated by having each advertisement closely linked up with all the other advertisements of the series. The use of the Independent Shield helps make a telephone advertisement persistent. This quality of persistency is one of the strongest forces in the developing of a successful business.

64. *Consistency of an Advertisement with Policy of Company.*—The best written series of telephone advertisements in the world, explaining how courteous and obliging the employes of this particular company are, will fall flat and be worse than ammunition wasted if the employes of that company are discourteous and unobliging. An advertisement should harmonize and be consistent with the policy of the telephone company. And in order to be consistent, it must have co-operation on the part of every employe of the organization.

Advertising is the mouthpiece of a business. It should accordingly be the true expression of the ideals behind that business. Try writing an advertisement for the First National Bank in the style adopted by the publicity man of a three-ring circus. One will see how ridiculous and inconsistent an advertisement can make a business seem.

As the fifth criterion, check every advertisement put out by this question: Is this advertisement consistent with the policy of my business?

65. *Constructiveness, the Sixth Criterion of Telephone Advertisements.*—Every advertisement should be constructive—it should actually build up and not tear down. It should be op-

timistic in its tone rather than pessimistic, for optimism sells goods while pessimism drives trade away.

Don't knock! Don't hammer! Don't pound! The telephone company which devotes all its advertising efforts to building up its own business and to pointing out its own advantages is sure to make gratifying progress.

66. *Plausibility as a Criterion of an Advertisement.*—There is a difference between telling the truth and being believed.

1. Will it appeal to the largest possible number of readers?
2. Is it specific? Will it bring business only to the company which is paying the bills?
3. Does it talk from the reader's point of view?
4. Does it help carry out the general plan of campaign?
5. Is it consistent with the policy of the business?
6. Is it optimistic and constructive?
7. Does it sound plausible?
8. Is it sincere?

Fig. 54. Eight Criterions for Telephone Advertising.

It is not enough that a telephone advertisement be simply truthful—it must tell its story in such a way that people will believe what it says, for if it is not believed, it will be doubted. That leaves the telephone company in a worse position than though it had run no advertisement at all.

Some men, of the J. Rufus Wallingford type, can make the biggest absurdities sound plausible. But such men are always afraid to work back over their tracks for fear of being found out.

The advertisement which sounds plausible is the one which will be read with the most sympathetic understanding and will, consequently, get the best results. It will pay any telephone manager to check all his advertising by this test of plausibility, which is given as the seventh criterion of an advertisement.

67. *Sincerity the Last Criterion.*—As stated under the discussion of the preceding criterion, there is a difference between being truthful and sounding truthful. Plausibility consists in sounding truthful. Sincerity consists in being truthful, and it goes without saying that every advertisement should be sincere.

Plausibility can be assumed, but sincerity can never be assumed—it must really exist. The manager of a telephone company is the one to judge whether or not an advertisement is sincere or truthful. He is in closer touch with the business than any other individual, and he knows better than anyone else what claims can be substantiated.

Honesty or sincerity is the final test of the telephone advertisement.

CHAPTER VII. Planning a Campaign.

68. *Necessity for Mapping out Advertising Plans.*—Before a contractor starts work on a building, he has the plan of that building carefully worked out on blueprints before him. It is the only way he can work efficiently, for otherwise he might start out to build a stone skyscraper and wind up by building a section of the subway. Before a general goes into battle he has his plan of attack carefully worked out. He has tested the strength of the enemy to find his vulnerable points, and has disposed his own forces so they can do the most effective work. If he were simply to march his troops ahead in an endeavor to see what would happen, he would very soon find out in a way not to his advantage. In like manner, before the manager of a telephone company goes into battle (for business is a battle) he should prepare a definite line of attack and should consistently follow out this plan. In his battle for business, he will find that the personal soliciting he does, or has done for him, may be compared with the infantry which actually takes the trenches of business. His advertising is the heavy artillery which bombards prospects and batters down their defences until it is an easy matter to take them by storm. In other words, the campaign is the thing, and a campaign means the following out of a definite plan of action.

Shooting an advertisement into the air and then waiting to see what happens is always disappointing because nothing happens. But if each advertisement be considered as one shot in a big campaign, and if the shots be well placed, results will follow just as certainly as day follows night.

69. *Amount to be Spent in Advertising.*—Before planning an advertising campaign, calculate your resources. That means, figure out how much money you should put into advertising. The best way to do this is to set aside a definite percentage of the income of the business to be used for advertising purposes. Then as the business grows, the advertising will likewise expand.

What this percentage should be must largely be left to the discretion of the management of the telephone company. Most retail stores consider 3 per cent. of their total sales the correct figure to devote to advertising purposes. Manufacturers usually devote more than this percentage, many of them figuring 5 per cent. of their sales, while some go as high as 10 per cent. Mail order houses, whose entire selling is done by means of advertising, can naturally devote a larger percentage of their sales to advertising purposes, because they have no other selling expense. Many of them invest as high as 20 per cent. in advertising.

Do not consider advertising an expense. Consider it as an investment which will bring back definite returns in the way of increased business and increased good will.

(*To be Continued.*)

Telephone Lines in the Plumas National Forest.

With additions to the Plumas national forest's telephone system, Plumas County, Cal., which will be completed this season, the government will have in operation in this one forest alone over 450 miles of line, according to Forest Supervisor D. N. Rogers. A new fire outlook station is being built on Pilot peak, above Onion valley, and this will be connected by telephone with the Howland Flat line. The lookout station on Mt. Fillmore has been abandoned, as a much better view of the Middle Fork slope can be secured from Pilot peak.

The telephone line at Belden will be extended from that place to the Great Western Power Co.'s camp at the mouth of the North Fork, and the line at Twain will be extended to Virgilia.

No very destructive fires have occurred this summer on the Plumas forest, due largely to the efficient lookout and patrol system maintained by the government authorities, in which the telephone is an important factor.

Practical Subjects—Letters and Discussions

"Telephony's" Home Course for Telephone Men.

(Not meant for serious study.)

By Well Clay.

I often notice closely,
As I watch from day to day,
The greetings of the people
That I see upon my way.

The warm handclasp of friendship,
And the ever cheerful smile,
Are varied for each person
And tempered for each style.

And I've made the observation,
That in most cases we will find
We're not thinking of the person,
But a picture in our mind.

One meets an aged mother
Who treads with weary feet,
In her journey to the market,
And with softened tones we greet.

For we see the years of sorrow,
And we know the load of care
That has stamped the tired features,
With the many wrinkles there.

The mother is before us,
But the picture in our mind
Is not the aged body
But the soul that stands behind.

We greet a dame of fashion
With her paint and furbelows,
As passing in her auto,
On her social round she goes;

Her smile is gracious to us,
And her manner is most kind,
But the only thing we see
Is a spectre just behind.

Our eye takes in the body,
But the picture in our mind
Is not what fronts our vision—
But the deeds which stand behind.

You daily greet your many friends
And clasp them by the hand,
But your love for them is tempered
By the things for which they stand.

Some chance has found them lacking,
Or some deed has proved them true;
Their acts and lives will focus
The scene that comes to you.

It is easy enough to say, and even think, you are treating every one alike but when you stop to think about the matter, you know better. You unconsciously defer to some and to others you act in a more or less patronizing manner at times.

You may say you are as good as any one in your community, but you know better. You know there are people who can "put it all over you" in a good many different ways. There are plenty of people who have more nerve, more brains, more money or more of many desirable things which make life worth while. You know there are people who are even more energetic or more ambitious than you are. Each one is different.

Take, for instance, those days which you spend in the office when you are called from your "fussing about your desk" to meet perhaps a score or more of people who have dropped in to pay their bills and incidentally to tell you about their "fones." Do you greet each and all the same? You do not.

To John Jones, who is a good fellow and never "kicks" in a vicious way, you are chummy and as pleasant as a basket of peaches. To another man, who is a tightwad and a persistent "beefer," always asking for a rebate for trival causes, you assume a belligerent attitude and put yourself on the defensive the minute his head shows in the door.

You know how it goes—a different salutation to every one of your several hundred customers. Some one way and some another. It is the most natural, and withal, the most diplomatic thing to do, for, if you think a little, you will come to the conclusion that the salutation one naturally feels impelled to give a person is the one which his or her attitude invites. We "get" what we "give." The kicker is looking for a chance for an argument and, while it may not be judgment to humor him, yet that is what would naturally please him best.

"As you give, so shall you receive" is as true as ever. Everything changes in our lives but human nature. We must not only be posted on mechanical things in our business, but must learn to read the pointers on the dials of humanity as well as on the wire chief's desk. We must also learn to tell whether the line is clear between the face and the heart or whether there is a heavy "ground" of selfishness interfering with good transmission. Perhaps the line runs by way of his purse and gets a "short" there, so that no matter what kind of a smile we see on the face, or think we see, there seems to be no way of "getting our message through."

In order that we may know each person that we greet through the cashier's window, it is highly important that we know each person's home environment or we will often be at a loss to correctly "size up" his personality. All homes are different and each has a personality as much as humans do, or cities or villages.

There is hardly another business in which the duties of its managers take him into the homes of his patrons so regularly, and which touches the daily life so intimately, in its normal state, as the telephone business. The doctor's visits find, usually, an abnormal state of feeling. The machine man, the stock-buyer and the "lightning-rod man" all visit the farm, but do not, as a rule, see the inside of the house or the members of the family at their daily tasks, as does the troubleman.

He is so well known that when he visits a farm home to "fix the telephone" during the absence of the family, he does not think anything of looking under the milk can on the back step for the key, or under the door step or elsewhere, as is the custom at most farm houses when the family absent themselves temporarily; neither does the patron. He expects you to do it, as he knows that you would not like to drive several miles a second time to do the job, and besides he wants the telephone "put in order at once."

That is one drawback about a telephone: A patron wants it in order all the while and is willing to waive anything in a small way, like breaking into a house, to have it kept in order, if necessary. In case one can't find the key, one can always go down the cellar and up the cellar stairs, for the inside cellar door is almost never locked. Like the way to the human heart, there is always some way to get into a rural residence if one must. The need of telephone service opens the way to both.

APHORISM: The right key will always unlock.

Rural Telephone Rates.

By B. F. Van Tress.

Mr. Kelsey, in his articles on the $1.50 and $1 telephone rates, has given us some mighty good food for thought. There is no denying the truth of his assertion: "If a telephone company anywhere is to be run at all as a business institution, it should be run to pay all help reasonably and to work them reasonable hours, to set aside depreciation reserves and keep the capital intact. It cannot be operated at a profit on $1.50 and $1 rates."

The telephone public may not wish to admit the truth of an argument of this nature, but they are bound to see the justice of an appeal for proper rates, when they are given real information on this subject. Publicity of the right kind, of a nature that will give the public a fair idea of the actual cost and profits in furnishing a satisfactory telephone service, is sufficient to convince all reasonable-minded people of the justice of asking a fair and equitable rate.

Every community has chronic kickers who will make an awful roar if any one mentions raising the rates. Many telephone companies are afraid of this element of a community and for that reason allow themselves to be handicapped by rates which are not sufficient.

Mr. Kelsey says in another article that no service should be sold for less than 5 cents per day whether the service is given on one, two, four or eight-party lines. This is especially true of country line service where the rate seems almost universally to be out of proportion to the value of the service and the cost of furnishing it. There is less profit in this class of service at $1 per month than there is in any other class of service.

To show the comparative profit as to the amount invested in different classes of service, here are some figures from an exchange which is typical of hundreds of others in the Middle West. These figures are not estimates, but are taken from an actual inventory of every item of property in the exchange.

The plant is divided into three divisions, as follows:

First. The cost of plant used to furnish service in the home city.

Second. The cost of plant used to furnish service to two adjacent towns.

Third. The cost of plant used to furnish service on rural lines.

The cost of plant used for toll purposes is added proportionately to the three divisions named.

Next, the actual income from the telephones of each of these three divisions for the year 1915 has been taken. The average income per telephone for the exchange for 1915 was $15.65.

	Home City	Adjoining Towns	Country
Number of telephones	200	100	138
Average income per telephone	$15.87	$18.23	$13.55
Average cost of plant per telephone	20.63	30.58	36.16
Proportion of income to cost of plant (per cent.)	77	60	37.4

The rates in this case are Kelsey's twins, $1.50 and $1.00. The profits for the home city are highest because of the higher income from the business places, and the smaller cost of plant for the shorter lines. These people get two-party line service, which is naturally better service than that furnished the other two divisions, which is ten-party line service.

The average income per telephone in the adjoining towns is high because of a large proportion of business telephones. On account of these people being on ten-party lines, they get poorer service for their money than any other class on the exchange. But the class which does not pay an adequate rate is the rural. The average income from this class is lowest, while the cost of constructing the long lines necessary to furnish farm-house service, is the highest of any class in the exchange. The cost of maintenance is also highest on the rural telephones, on account of the time of the lineman and rig in keeping up the lines and clearing trouble.

Now, can any one give a good reason why the farmer, who receives the most benefit from telephone service and whose line is most expensive to build, should pay the least for his service?

The situation at present is that the rural subscriber gets his service at just about cost, or less than cost, while the subscriber who lives in town must pay not only the cost of his service, but all the company's profits besides.

The farmer of this country, certainly, is not generally considered as an object of charity, and there is no good reason why people who live in town should pay his telephone bill for him, or any part of it. But, under prevailing rates, that is just what is happening. When the man who happens to live in town pays his telephone bill, he pays about one-third of the farmer's bill also—and when the farmer gets around to it, he comes in and pays the rest of it.

If the rural subscriber's rate in this case were increased from $1 to $1.50, then the average income per telephone for his class would be $19.55 per year. This sum, on a basis of what his line cost, would make the proportion between income and cost of plant at 54 per cent., which is still less than that in each of the other two divisions.

If these figures are applicable to the average small exchange it is evident that no rural subscriber should pay less than $1.50 for his telephone service. It is true that there are some exchanges where the average income for the rural telephone is higher than in this case, as for instance, where the rural subscriber has to pay toll charges to talk to the business center of his community. In this case the toll charges make the income from his telephone higher.

With the average rural line, I believe we will soon see the day when no telephone company will furnish service for less than $1.50.

In regard to rates in general, when a telephone rate is once established, the longer it remains, the more unchangeable it seems to become. For this reason, if an established rate is too low, steps should be taken to make an increase. This should not be such a dreaded undertaking, for we have the public service commissions to tell us whether we are justified in the rates we ask for.

Logically, in revising a schedule of rates, it would seem that the first consideration is to establish rates which are properly equalized. One, two, and four-party line rates for city and eight or ten-party line rates for country lines, should be based on the cost of service, and the value of the service to the subscriber. Two-party line service, for instance, is better service than four or eight-party line service, and should bring more money.

When the rates are properly equalized, if the income resulting is not sufficient to operate the plant properly, then a proportionate increase of all rates should be made. This will produce an income which will enable a company to put the plant in a substantial condition, and operate it so as to furnish first class service. I believe the public and any commission will agree on this point.

It is certain that this undertaking of raising the rates will not become easier by putting it off. When it has been undertaken and accomplished, and the smoke has cleared away, we will see how much more satisfactorily our business can be operated, for every one concerned and we will wonder why the change was not made sooner.

"Precious Jewels Come in Small Packages."

By R. I. Utter.

Contrary to the adage, "Precious jewels come in small packages," the impression exists in the minds of many people that the large manufacturers, of unlimited resources and facilities, are the ones who advance the art in which they are engaged, thereby benefiting the public.

While this impression may be well founded and true in certain cases, it does not hold good in the telephone field. In proof of this statement attention is directed to the fact

that prior to the middle nineties, the telephone operating and manufacturing field was almost entirely controlled by one corporation. It was to its advantage to hold to the same line of equipment in order to decrease manufacturing cost rather than to develop new ideas and short-cut methods, and to install them for the benefit of the telephone-using public.

Up to the time the Independent movement began in the middle nineties, the old Blake transmitter was used almost universally. We all know how inefficient and impractical this transmitter was. One of the moves made by the Independent manufacturing companies was to develop a high efficiency transmitter and use this transmitter on all instruments, whether they went to the backwoods or were to be located in the large cities. Contrary to this movement, the monopoly corporation, after developing a new transmitter, in place of using it on all telephones removed the old Blake instruments from large cities and sent them to the smaller exchanges, using the new transmitters at the larger centers of population and thereby benefiting only a small portion of the telephone users.

Why is the harmonic ringing system? The answer to this is simple. Manufacturers in the Independent telephone field and the operating companies realized that the code and biased ringing system used by the monopoly was not satisfactory—the code ringing causing too many eavesdroppers on personal conversations while the biased ringing caused no end of trouble. Due to adjustment of ringers, the tapping of the gongs at the wrong stations also required the installation of ground rods for ringing purposes at the subscriber's station. Harmonic ringing is a product of the Independent companies and has none of these faults.

Other developments have followed, such as the automatic load distribution. This gives the subscriber more rapid service, keeps the operator busy at the switchboard resulting in better discipline in the operating room. This was accomplished by the introduction of the multiple line lamp which places the calling subscriber's line signal before several operators, thus assuring prompt answering of all incoming calls. This feature is purely Independent in its origin and has been adopted by the monopoly corporation only where it enters into the Independent field and the purchaser insists upon that type of system.

Following the multiple line lamp, the operator lock-out service developed. This became necessary on account of more than one operator seizing an incoming call. It is so arranged that in such a case as mentioned, the first operator inserting the answering plug of a pair of cords, will be the only one who can get in on the connection. This is another child of the Independent family.

What about the automatic flash recall? The first automatic flashing recall system was installed at High Point, N. C. Circuits, equipment, and installation were the products of an Independent factory. The monopoly corporation is at the present time using a flash recall system, bidding in competition with the Independent telephone manufacturers.

In connection with this it might be mentioned that some Independent manufacturers are using and recommending a line lamp recall which produces high efficiency and gives the recalling subscriber the same service as he would receive on an originating call. This feature, no doubt, would also be adopted by the monopoly corporation but is so covered with patents that it has not seen fit to adopt this line lamp recall. It does all in its power, when competing with Independent manufacturers, to discredit its use and pushes the use of the flash recall.

Another product of the Independent manufacturing company is the instantaneous disconnect and recall which is as essential to a rapid service exchange as lubricating oil is to the smooth-running machine, and is as much appreciated by a busy merchant or other subscriber as a comfortable bed after a hard day's work. This feature involves the removing of the busy test from the calling subscriber's line the instant the receiver is placed on the hook, leaving this line accessible for any party calling in, even though the operator has not removed the connecting cord used on the previous connection. It will be readily seen that this does away with a large amount of trouble and dissatisfaction caused by the operator informing a calling subscriber that the line is busy, when in reality the cause of her receiving a busy signal is the result of some other operator not taking down the old connection.

Where does the credit lie for the small compact common battery and magneto telephones which are in general use today? These were originally designed by Independent manufacturers and the monopoly corporation was compelled to do away with its old long-back boards and antiquated telephone cabinets, building steel and small type wood sets to satisfy the public demand, after the Independents had led the way and showed the public how the size of the telephone cabinet could be reduced.

Mr. Independent Operator, it would be possible to call your attention to any number of such improvements as have been mentioned which have been developed and introduced by the Independent manufacturers. In closing it might be said that the Pupin coil which makes it possible to talk great distances was developed by an Independent mind.

The indestructible receivers, some having a metal framework inside of the shell, others being constructed of Bakelite, is also another product of the Independents. To this date the monopoly corporation has not so constructed its desk stands but that they will break at the neck if by accident they fall to the floor or are otherwise jammed, while the Independents are producing desk stands with non-breakable necks.

Do not let the number of salesmen on a job and the size of the plants with enormous pay rolls lead into the belief that the large corporation is doing the development work which decreases operating and maintenance expense and increases income.

One Subscriber's Method of Expressing His Appreciation.

The following expression of appreciation appeared in a recent issue of the Toledo (Iowa) Chronicle over the name of one of the telephone subscribers in that city:

"I wish to take this means of expressing my appreciation of the Commercial Telephone Co. for its efficient system and the courteous and capable services which its operators give to the public at Toledo, Iowa.

I have quite an extensive toll business over Iowa and very frequently call from different points, large and small, and I am frank to admit that Toledo has a little the neatest service in the telephone business that I find in any place in the state."

H. B. Shoemaker is manager of the exchange referred to, as well as president of the Iowa Independent Telephone Association. He states that he much prefers this bouquet now while he can appreciate it than to have flowers placed upon his coffin.

Weather Bureau to Use Lines of Telephone Company.

By a lease arrangement with the Cumberland Telephone & Telegraph Co. the local weather bureau at Chattanooga, Tenn., will make use of the wires of the telephone company to conduct the offices and the river front, where the regular readings of the gauge are taken. For a long time the government has maintained its own wires on Broad street and these will now be done away with.

Value of an Audit to an Operating Telephone Company

Purposes of an Audit in Early Days of Accounting and Auditing—Primary Objects of Modern Audits—Analysis of Income and Expenses Valuable to Companies in Presentation of Their Cases to Commissions in Rate Controveries

By H. E. Waterhouse

The value of the publicity of audited accounts cannot be over-estimated. In a general way all corporations are believed to be making unreasonable profits, particularly all corporations which in any way attempt to serve the public. For instance, in New York City, the taxicab companies have been attacked by the newspapers. One ordinance after another has been passed regulating fares, all, of course, reducing them and in the course of four or five years losses running into millions were sustained by three or four of these companies. During this time they had not made periodical statements to their stockholders, or to the public, setting forth these losses and the reason therefore.

Corporations which are secretive about their accounts, or which issue statements not certified to, have only themselves to blame if they are made the victims of hostile legislation.

The above is an extract from a chapter which I have recently read on the subject of auditing. It caused me to think how very little the average business man or small corporation, actually appreciates the true purposes and value of a periodical audit.

Past and Present Purposes of an Audit.

Having in mind particularly telephone companies of the size designated by the Interstate Commerce Commission as "class B" and "class C," it is pretty safe to say that 90 per cent. of their boards of directors would view with horror the suggestion that their accounts for a given year or period be audited and certified to by an expert accountant. Doubtless they look upon such a proposal as an absolutely unnecessary and reckless extravagance in the matter of expense.

The answer would be: "We've known our manager, bookkeeper, and collectors for years. They've grown up among us and we have every confidence in their honesty and integrity. Why, then, spend a goodly sized sum of money in checking over their work when it can better be distributed among our stockholders in the form of dividends?"

Years ago, in what might be termed the early days of auditing and accounting, an audit was almost invariably undertaken with no objects in view but the detection of fraud, its prevention and the location and correction of errors. But now-a-days these, in the majority of cases, are considered only minor issues when an audit is ordered or performed.

The primary object of an audit is to obtain a true and intelligible statement of the condition of the affairs of the company for the information of those controlling its destinies and those who have supplied the finances for its capitalization and operation. Also to have a careful analysis of its income and expenses which will reveal any neglected or undeveloped sources of income or any excesses or leaks in the matter of expense with suggestions for the remedying of same.

As a basis of credit, too, a well compiled and duly certified balance sheet and financial statement is of inestimable value. Submitted to the various agencies which compile ratings for dissemination among mercantile houses, such a statement will inspire confidence and a favorable report much more readily than an unintelligible effort, self prepared, from some other concern which in reality may be in better condition financially but quite unable to satisfactorily demonstrate the fact.

With telephone companies, there is an additional advantage in a comprehensive audit that cannot be too strongly emphasized.

In the past the railroads have borne the brunt of government supervision and rate regulation, but the time has now been reached when it must be plain to everyone that railroad rates cannot be further pared and the regulator must perforce cast around for new fields of endeavor. The telephone company, consequently, is coming in for a large measure of attention in this direction.

As we pick up our weekly copy of Telephony and glance over the immensely interesting and instructive pages under the heading, "Proceedings Before Commissions, Courts and Councils," we observe that a protest has been made against the rates charged by the local telephone company at a certain point and that a hearing is fixed before the ruling commission of the state for a given time, when it will be necessary for the company to appear and show cause why a reduction of rates should not be ordered.

Of course the protesting parties will be there, armed with information showing where, in other towns of similar size known to them, service is given at lower rates than in this city. They probably will also have information from some friend at the other point, who may be a stockholder of the telephone company there, telling that a profit must have been made on the operations at the lesser rate because a satisfactory dividend had been declared for the preceding year.

How extremely valuable, then, to the defending telephone company would be a comprehensive balance sheet and income and expense statement properly authenticated by an expert accountant, which would show that the rates charged did not more than produce a reasonable return upon the investment in plant and equipment and that any reduction of rates would be productive of hardship. Failure to exhibit convincing evidence of these facts might reasonably produce results favorable to the opposing side, better equipped in the matter of argument.

Again, we read of a company which desires an increase in rates in order to meet increased cost of operations. It is well known to telephone men that cost of operation per station increases as the number of stations increase, but this fact is one extremely difficult to get into the head of the man in the street or anyone else not conversant with conditions telephonic. A company, therefore, must come before its commission with evidence to justify its claim. And it must be apparent that the company which can come with statements properly prepared and authenticated, showing the comparative earnings and expense for a number of years, must be more favorably placed than if it came with bare argument unsupported by convincing figures.

Audits As Evidence for Commissions.

It has become fairly well established that the governing commissions of the various states do not seek to impose upon the companies under their jurisdiction anything in the way of regulation which is unjust. In the matter of rate regulation they particularly seem to be at all times prepared to allow a fair return upon investment. But in rendering their decisions they must, like any other court or arbitrating body, be guided by the most convincing evidence. Is is not their own fault, then, that a company fails to obtain a rate increase if it has come with its application unsupported by the strongest possible evidence?

A company is recalled to mind which a few years ago called the writer in to make an examination of its accounting system. It operated several exchanges apparently at a

profit because each year it was able to reduce its indebtedness and transfer a substantial sum to "surplus." This appeared to its officers a highly gratifying condition and it is probable that but for the Interstate Commerce Commission's order on accounting, they would never have called for any assistance at all.

A careful analysis of income and expense for the various exchanges, however, revealed the fact that the whole of their profits were being derived from their two principal exchanges and that the remaining exchanges were being operated at a loss.

This information placed that company in a position to go before the governing commission in its state and obtain increase of rates for the exchanges which were being operated at a loss. The result is that the company is now probably in the happy position of each year paying off a little more indebtedness and transferring a larger amount to "surplus" or paying out a dividend.

A further interesting point is this: A telephone plant is continually being added to in value in respect of extensions of lines and telephones for new subscribers. The cost of these additions is of course chargeable to "capital," but it is seldom that additional stock is sold to provide the money to meet the outlay. Far more often the payments are made from accumulated profits on operations. The result is that at the end of the year there is no money in the bank wherewith to pay dividends. While a well prepared balance sheet would show that the value of assets had increased by an amount equal to the year's profits and consequently the stockholders share had risen in value above par, the average stockholder would, in the absence of a dividend check and any such statement to demonstrate the actual existence of a profit, be pretty hard to convince that he was not in on a pretty unprofitable investment.

All of this, taken in conjunction with the incidental protection against fraud and error seems to the author to make out a favorable case for the annual or periodical audit of the books of a telephone company.

Many of the more progressive telephone companies are now having their audits performed half-yearly and in some cases quarterly. They find in the greater frequency, additional satisfaction and protection due to the fact that the auditor's regular visits keeps their office force up to a greater degree of efficiency and energy in that their work must be kept closed up to date in anticipation of his coming.

The uniform system of accounts prescribed by the Interstate Commerce Commission and the governing bodies of the various states, have done much to lead the smaller telephone companies to a better understanding of their true financial condition. But the installation of a system of accounting which will meet the requirements of these bodies, only lays a pathway whereby an auditor may the more readily reach a satisfactory understanding of the true condition of a company and its finances.

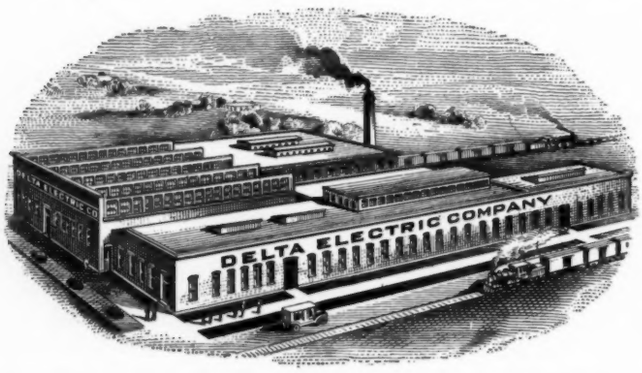
From Factory and Salesroom

Conventions: Indiana Independent Telephone Association, Indianapolis, September 14-15; United States Independent Telephone Association, Chicago, December 5-8

Delta Electric Co. Installed in Its New Factory.

The Delta Electric Co., of Marion, Ind., which suffered a disastrous fire during April of this year, is now reported to be operating with full capacity in its new factory, a view of which is shown in the accompanying illustration. At the time of this fire, fortunately, the new building was at the point of completion, so the company was able to resume its operations almost immediately.

This company was organized a few years ago in Chicago



New Factory Building and Property of Delta Electric Co.

for the manufacture of an improved party line telephone system and improved type pay station. Since its organization the company has marketed a number of electrical specialties which now have a world-wide reputation.

The Delta Electric Co. was formally incorporated in Marion, Ind., during the middle of 1913. It immediately engaged in the manufacture of the products which were started in Chicago and has prospered from the very beginning.

The Delta Electric party line system is in general use throughout the United States and Canada with some foreign installations in addition. Some of the most prominent operating telephone companies in this country and Canada, the company states, have been using the equipment for a number of years and report that it gives absolute satisfaction.

The service is practically identical with that given on private lines. From two to fifteen stations can be operated on each metallic line. The operation at the switchboard is entirely automatic so that the exchange operator makes all calls with the same number of operations, as when calling on an individual line.

The Delta Electric Co. has complete descriptive matter covering its party line system which can be had upon application.

Paragraphs.

HARRY B. BURLOW has been appointed advertising manager of Templeton, Kenly & Co., Ltd., 1020 South Central avenue, Chicago, manufacturers of the Simplex pole jack. Mr. Burlow is an advertising man of considerable experience, having recently severed his connection with Sulzberger & Sons, packers. The popularity of Simplex jacks has grown to such an extent that the company has found it necessary to create a bigger organization to keep apace with its business.

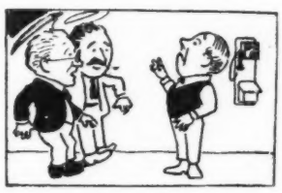
How One of the Monarch Salesmen Spent His Vacation.

Wm. F. Qualls, traveling salesman for the Monarch Telephone Mfg. Co., in Missouri, Kansas, and Arkansas, has considerable artistic talent as well as ability as a salesman of Independent telephone apparatus, as the accompanying sketches will testify. While on a recent vacation, which he spent in Kansas City, he kept his friends at the home office of the Monarch company at Fort Dodge, Iowa, well informed as to how he was spending his time by means of some interesting letters accompanied by appropriate sketches. The first epistle received from Mr. Qualls, written on the first morning of his vacation, follows:

It Happened Seven Years Ago In North Platte

There was a 13-year-old Chicago Telephone in a merchant's store in North Platte.

George Fields, Superintendent of the local exchange, wanted to replace it with a new one.



"Not on your life," said the merchant, "I've never had any trouble with that telephone. I'm not going to take any chances. It may not be much on looks, but it's good enough for me."

Mr. G. A. Briggs, our president, heard that remark. He had heard similar ones on his visit to exchanges that had bought Chicago Telephones 13 and 14 years before. An idea jumped into his mind. "That kind of a telephone is good enough to guarantee," he reasoned.

Then and there Telephone Trouble Insurance was born.

Since that day every Chicago Telephone has carried an Unconditional Guaranty. Also a Trouble Insurance Policy legally binding us to pay every cent of Trouble Expense which occurs upon that telephone.

Exchange owners have torn the "Trouble Expense" page out of their ledgers by purchasing Chicago Telephones. They are giving their subscribers better service with the telephone "that's good enough to guarantee."

Test Chicago Telephones At Our Risk and Expense

Chicago De Luxe Telephone
(Extra Compact)

Use This Coupon Now

Chicago Telephone Supply Co.,
Elkhart, Indiana.

Gentlemen: Please ship by freight / express .....Code No. 19 Chicago De Luxe Telephones, (How Many) equipped with powerful 5-bar generator, 1600-ohm ringer, 2 Columbia batteries, guaranteed lightning arrester, installing screws, etc., complete.....**$10.00 Each**
F. O. B. Elkhart, Indiana.

CHICAGO TELEPHONES SATISFY

Equipped with Secret Ring Push Button, extra, each.....**25c**

Equipped with Ring-through Condenser, extra, each.....**25c**

If the telephones do not prove to be the best we have ever used it is understood they may be returned for full credit and the Chicago Telephone Supply Co. will pay charges both ways.

Name .....

Address .....

Chicago Telephone prices are not being increased on account of the war. We are absorbing the increased cost of materials, not loading it upon our customers.

"SILENCE—The silence of the tomb is as a deafening noise compared to that which pervaded the household on this auspicious morning. The clock had been muffled, the cat chased off the premises, the curtains tightly drawn about the sleeping porch to exclude the morning sunshine and the gold fish moved into other quarters, that silence and tranquillity might reign supreme. The housewife pussy-footed about her morning duties and the iceman and grocer's boy were subdued into abject silence before being permitted to cross the threshold.

The weary traveler, whose brow had been scorched by the hot winds from off the Kansas plain and whose insides had been scrambled by frequent association with Missouri Pacific freight trains, lay prone upon his couch and only his deep breathings gave evidence that the spark of life still lingered within the torso.

Some of the tenseness which permeated the atmosphere of the household spread to the outside, and the neighbor's children went about their play in subdued tones, while the birds twitted to themselves more softly than usual, in the tree tops overhead. Old Sol seemed to appreciate the situation, also, and appropriately hid his beaming countenance behind a cloud during the morning hours.

Vacation had begun and the lord of the household lay sleeping the sleep of a guiltless conscience, without a single disturbing thought of time or trains."

Following is another letter from Mr. Quall which accompanied the sketch of a section of the bleechers at the baseball game which he attended:

"Yesterday I went to the ball game and saw Indianapolis give the Kansas City bunch one of those old-fashioned

Enthusiasm of Wm. F. Qualls at a Baseball Game.

Hoosier trimmings—such as we used to give the boys when 'you and I were young.'

I almost started a riot at the game yesterday, though. Somehow I just couldn't keep from rooting for Indianapolis. Some of the rough-necks sitting close to me didn't like it—and said so—but I dared the whole bunch to come out into the field and we would show them what a Hoosier was made of. When they started, it occurred to me that I had better take my glasses to a place of safety, as they are fragile. When I got back everybody had gone home.

Anyhow, it was a great game: Indianapolis 6, Kansas City 4. There is a double-header today, so guess I will go again."

The last letter sent by Mr. Qualls from Kansas City was accompanied by the sketch of the lion, which is reproduced on this page, and contained this laconic message' "On

"On Again—Gone Again"—Mr. Quall's Vacation is Over.

again—Gone again. Will leave Kansas City Sunday night for trip in Arkansas; vacation is over and I am feeling fine."

All In the Work of the Day.

By Duncan M. Smith.

With her hand on the pulse of the restless world,
That will not in its rush be stayed,
The girl at the board serenely sits
As the message of hope or horror flits,
While the signals flash and fade.
Gossip and business and playing of wits
Run the gamut from grave to gay.
Mankind in a common bond she knits,
And it's all in the work of the day.

When her voice, o'erleaping leagues of space
With its "Number Please?" comes clear,
The listener waits as he hums a song
And he hears the echo all day long
Of her tones as they fell on his ear.
His smile chirks up and his grouch goes wrong,
For her answer, soft, turns wrath away
As he loses self in the busy throng,
And it's all in the work of the day.

'Mid the ceasless click of connecting steel
Comes a call for aid, perchance—
Fire or flood or the cyclone's wrath,
A wreck or a shot on a lonely path—
She summons the doctor, the ambulance,
The nurse, who must soften the aftermath;
But her name, deed-linked, in the morning gray,
Men tell it neither in Rome nor Cath,
For it's all in the work of the day.

To Use Poles Jointly in Kansas City, Mo.

An agreement has been reached between the Kansas City Home Telephone Co., of Kansas City, Mo., the Missouri & Kansas Telephone Co., and L. H. Chapman, commissioners of lights and water in Kansas City, Mo., for the joint use of poles in that city. This action will result in the removal of from six to seven thousand poles from the streets, or two-thirds of the poles now in use.